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ABSTRACT

The teaching guide for providing instruction in use of the metric system contains materials geared for the daily activities of the home. Contents of the guide are organized into four parts. Part 1 is a brief description of the history of the metric system and reasons for conversion in the United States. The major portion of the guide, part 2 (learning the metric system of measurement), is a transparency presentation with narration. It consists of 72 transparency miniatures with the accompanying narration, followed by the numbered transparency masters for preparation by the instructor. Part 3 contains eight learning activities and a post-test. The topics include body measurements, volume, weighing food, garment construction, length, and temperature. The reference materials in Part 4 are (1) glossary and annotations, (2) suggested classroom activities, (3) conversion charts and other references, (4) sources of metric supplies, and (5) a bibliography. (RG)

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ED129992

SI*

SYSTÈME INTERNATIONAL

A METRIC WORKBOOK FOR TEACHERS OF CONSUMER & HOMEMAKING EDUCATION

PUBLISHED BY

ORANGE COUNTY

DEPARTMENT OF EDUCATION

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EDUCATION & WELFARE
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*Système International d'Unités or International System of Units

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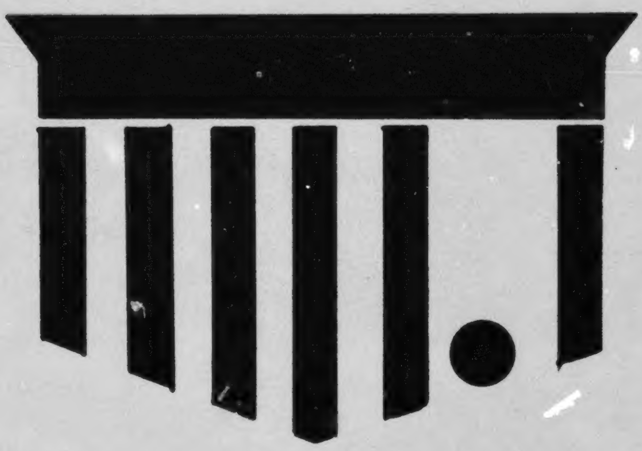

The U. S. Metric Study emblem uses the American shield in a special way: The stripes represent the six base units of the International Metric System and the dot, its decimal ratios.

"S.I. . . . A METRIC WORKBOOK FOR TEACHERS OF CONSUMER AND HOMEMAKING EDUCATION"

. . . has been compiled for you by Carole Bielefeld, Coordinator, Home Economics and Women's Occupations, Orange County Department of Education,

. . . with input on classroom activities by Kathleen Morris, instructor at California State University at Long Beach and Orange Coast College,

. . . with input on the "round robin" activities by Jan Parks, instructor at Santa Ana College, Family and Consumer Studies Department,

. . . with advice and assistance from Lorelle Young, instructor at West High School, Torrance Unified School District, Torrance, who has initiated much of the metric involvement by the California Home Economics Association,

. . . and, was inspired by the Metric Conference at University of California, Los Angeles, held on September 7 and 8, 1973.

NOTES

The material contained within this workbook is geared for the daily activities of the American home. It is not intended for use by mathematicians or scientists who would be seeking metric information in greater depth.

The workbook is presented in a format which should be easy to use by instructors of Consumer and Homemaking Education. It is expected that the home economist will play a vital role in the distribution of metric information to the consumer.

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PART I: INTRODUCTION

A. A HISTORY OF THE METRIC SYSTEM

B. IS THE U. S. GOING METRIC?

C. ARE YOU READY FOR METRICS? (PRE-TEST)

A. A HISTORY OF THE METRIC SYSTEM

The metric system originated in France where it was adopted by the National Assembly on April 7, 1795. Most nations in Europe, Central and South America adopted it for commercial use during the middle and last half of the 19th Century. Following World War II, the Soviet Union and China made the use of metric units mandatory. India and Japan followed in the 1950's. Britain began a ten-year conversion to the metric system in 1965. South Africa will have completed the metric conversion by 1975. In 1969 New Zealand began an eight-year conversion to metric units, and in 1970 Australia and Canada announced their commitment to metricate.

In the United States. Use of the metric system in the United States was made legal but not mandatory by an Act of Congress in 1866. Since that time, all U. S. customary units of measurement have been based upon metric standards.

Several bills which would have made the use of the metric system mandatory failed in Congress by very small margins during the first 30 years of this century.

In 1968 the Miller-Pell Metric Study Bill was passed. It authorized the Secretary of Commerce to conduct a program of investigation, research and survey to determine the impact on this country of the increasing worldwide use of metric units and to determine what action should be taken in the United States as a consequence.

On July 30, 1971, the results of the study were presented to the U. S. Congress in a report titled A Metric America--A Decision Whose Time Has Come. In releasing the report, Secretary of Commerce

Maurice H. Stans said, "For many years, this Nation has been slowly 'going metric', and it would continue to do so regardless of national plans and policies. At the same time, the worldwide use of the metric system is increasing, and today ours is the only major nation which has not decided to take such a step. As the Report states, a metric America would seem to be desirable in terms of our stake in world trade, the development of international standards, relations with our neighbors and other countries, and national security." He also emphasized that early priority be given to educating every American school child and the public at large to think in metric terms.

There now remain two major steps: (1) approval by the Congress for a national coordinated metrication program, and (2) the establishment of an agency to plan and direct such a program.*

Dr. Wilson Riles, Superintendent of Public Instruction of the State of California, has announced his personal commitment for a changeover to metric instruction in the schools. The reasons for his commitment are threefold: (1) metrication is inevitable in the United States, (2) the metric system is much more efficient than the customary system that we now use, and (3) the students will find that it is easier to learn.

Dr. Riles stated that "the schools must lead--and not lag--in the movement toward metrication. The process of conversion is much smoother and much less costly when education changes over early. In England, the schools got off to a slow start in metrics instruction; that country's transition encountered many problems and much confusion as a result. By contrast, Australia's schools were in the forefront of the conversion to metrics; the result is a much more orderly and successful transition in that country."

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*REFERENCES:

Metric Units of Measure, 10th edition, Metric Association, Inc., 2004 Ash Street, Waukegan, Illinois 60085, 1972.

"Metrication for the Family," South African Bureau of Standards, Pretoria, May, 1971.

Further, he stated, "I believe that California should take the lead toward metrication in America. I believe that the schools should be in the forefront of the metrication movement. That is why I made these recommendations to the State Board of Education in the spring: First, endorsement of pending legislation to provide funds to train teams of teacher-trainers in metrics. Second, action by the State Curriculum and Supplemental Materials Commission to plan for metrics textbooks by 1976. Third, support for colleges and universities to move to metrics in the training and education of new teachers.

"There is another area of effort I have also emphasized. I am not worried about the ability of children to learn metrics with ease. But those of us who are older--parents and citizens--will face a tougher adjustment. Our adult education system and the communications media will have to be involved in the effort to help the public learn to 'think metric.'

"The Department of Education is working to develop plans for such training through its existing staff and resources. We will also pursue other related projects. Vocational education and *home economics* (italics provided by editor) classes, in particular, will need special help which we will provide."*

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*REFERENCES:
Speech given at UCLA at the Metric Conference, September 7, 1973.

B. IS THE U. S. GOING METRIC?

Most persons would probably be shocked to hear the U.S. described as a backward country. But that seems the most appropriate word to describe this country's cumbersome system of weights and measures. This measurement hodgepodge, called the customary or English system, is about to change. At this time, there are bills in Congress requiring that the U.S. establish a program to convert to general use of the metric system, within ten years from the date of enactment. It seems certain that Congress will vote for conversion.*

There are well defined advantages and disadvantages to the metric conversion. Specific advantages that industry could realize by adopting to the metric system are as follows:

1. Metric is a Universal System. World trade is constantly growing. A changeover to the metric system could stimulate sales and help balance exports against imports.
2. The Metric System is Easier to Use. The measuring units are interrelated and are also in multiples of 10 or divisible by 10.
3. Calculations are Faster. The system is particularly adaptable to computers and calculators.
4. Less Chance of Error. Decimals replace fractions which in the conventional system make calculations slower and increase chance of error.
5. Interchangeability of Machine Parts. Adoption of the metric system could lead to universal standards for machine parts, permitting them

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*REFERENCES:

Joyce Patterson, "Think Metric to Meet the Challenge," Co-ed, September, 1972.

to be used on machines of different makes.

6. Standardization of Tools and Gauges. Universal acceptance of tools would reduce the number of each that would be needed by industry and individual workers.
7. Especially Useful in the Laboratory. Tests and laboratory instruments are easily calibrated and simpler to read.
8. Eliminate Double Measuring System. Factories in both the U.S. and foreign countries must produce equipment for both metric and customary measurements. This double standard creates confusion and a greater cost.*

In the conversion to the metric system, the greatest disadvantage for Americans would be in acceptance of the changeover--not in learning the system itself. There is also a concern as to the ultimate cost.

1. Reluctance to Change. Resistance to change is a natural human response. Educators and industry have a vital role to play in assisting the American population to more easily accept the changeover to the metric system of measurement.
2. Expense. The change to metric units by industry takes money. But, with careful planning, much of it can be phased into the normal costs of replacement of equipment and machinery.

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*REFERENCES:

Wilmer Westbrook, "The Metric System," Modern Textiles, August, 1970.

Will the U. S. go metric? It is already going metric. Many large American corporations are already converting to the metric system: IBM, Honeywell, General Motors, Regal-Beloit, ITT, General Mills, as well as many others. The 1974 Ford Pinto and Mustang have metric engines. We have long been measuring film metrically: 35 mm film, 16 mm film, and the 8 mm film (Super 8). In restaurants we order the house wine by the litre or half-litre flask. Sports enthusiasts should now be very aware of the 100 metre track race, or the 50 metre swimming pool. We often read in the newspaper about narcotics officers confiscating a "kilo" of marijuana. The pharmaceutical industry has used the metric system for years. Many hospitals have converted to metric units for patient statistics and dispensing of drugs. All distances and elevations in the firing of weapons by the U. S. Army are now measured in metres as is basic triangulation by the U. S. Coast and Geodetic Survey.

It is clear that much of the U.S. is already metric. We are now awaiting Congress to pass the bill which will provide the official direction for a coordinated, systematic and organized conversion plan for this "new" system of measurement.

C. ARE YOU READY FOR METRICS? (PRE-TEST)

Please fill in the correct answers:

1. 1 ounce = _____ tablespoon(s)
2. 4 ounces = _____ gill(s)
3. 16 tablespoons = _____ cup(s)
4. 32 ounces = _____ quart(s)
5. 105 quarts = _____ barrel(s)
6. 1 cord = _____ cubic foot/feet
7. 4 pecks = _____ bushel(s)
8. 1 bushel = _____ quart(s)
9. 1 peck = _____ quart(s)
10. 1 ton = _____ pound(s)
11. 16 ounces = _____ pound(s)
12. 1 dram = _____ gram(s)
13. 12 inches = _____ foot/feet
14. 1 rod = _____ foot/feet
15. _____ feet = 1 mile
16. _____ yards = 1 mile
17. _____ rods = 1 mile
18. _____ cubic foot/feet = 1 cubic yard

Correct your answers to the Pre-test:

1. 2 tablespoons
2. 1 gill
3. 1 cup
4. 1 quart
5. 1 barrel
6. 128 cubic feet
7. 1 bushel
8. 32 quarts
9. 8 quarts
10. 2000 pounds
11. 1 pound
12. 60 grams
13. 1 foot
14. 16 1/2 feet
15. 5280 feet
16. 1760 yards
17. 320 rods
18. 27 cubic feet

Scoring:

18 - 16 correct: CONGRATULATIONS! You really know the customary system, but you'd better get ready for the metric system anyway. It's coming!

15 - 11 correct: PRETTY GOOD! It may be difficult to adjust, but you have only about one-half of what you already know to forget!

10 - 0 correct: LUCKY YOU! You have almost nothing to unlearn. You'll love the metric system!

PRE-TEST: Developed by Kathleen Morris at California State University, Long Beach.

PART II: LEARNING THE METRIC SYSTEM OF MEASUREMENT

. . . A TRANSPARENCY PRESENTATION WITH NARRATION

INSTRUCTIONS TO TEACHER: PREVIEW

▶ Before showing the transparencies, preview the visual aids as to:

litre

metre

gram

Celsius

Note: Directions for developing these materials are found in Part IV (pages 47 to 50).

▶ Show division of metre into 100 sections known as "centimetres."

▶ Show chart or distribute individual handouts with information as to "Some Common Units" and "Metric Usage."

Note: These appear in Part IV (pages 45 and 46).

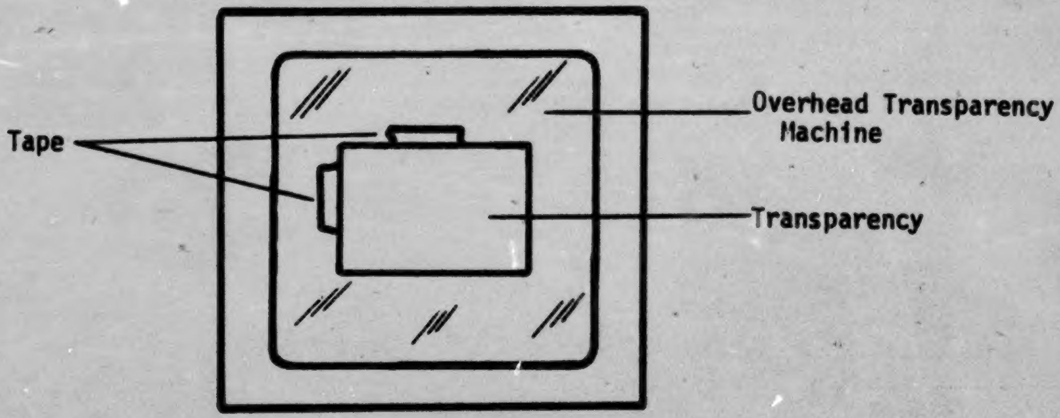
INSTRUCTIONS TO TEACHER: MAKING THE TRANSPARENCIES

- Remove pages from workbook of the transparency masters (located after page 25 of this workbook).

- Make the transparencies (find out the instructions for making transparencies from your local audio visual expert).

- Cut each sheet in half to provide separate half-sheet transparencies.

- Lay the first transparency on the projector and check the placement for best viewing. Frame this transparency on the glass. This procedure will provide a guide for consistent transparency placement.

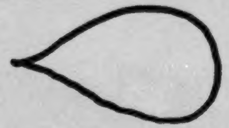


LEARNING THE METRIC SYSTEM OF MEASUREMENT

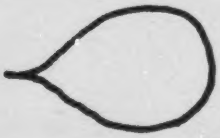
Transparency Miniature	Narration	
SI ... System Internationale or International System of Measurements	S. I. is the official system of metric measurement that will be adopted by the United States. The "Systēme International d'Unités" or System of International Units was officially adopted in France in 1795.	1
US Metric Study emblem:	The U.S. Metric Study emblem uses the American shield in a special way: the stripes represent the six base units of the International Metric System and the dot represents its decimal ratios.	2
(world map)	The United States is the only large country in the world which has not yet committed itself to convert to the metric system of measurement. Only 12 other countries besides the US have not committed themselves: Barbados, Burma, Gambia, Ghana, Jamaica, Liberia, Muscat, Oman, Nauru, Sierra Leone, Southern Yemen, and Trinidad.	3
(Ford Pinto)	The U. S. is already going metric. Many industries have already converted. The 1974 Ford Mustang and Pinto are metrically scaled.	4
(film)	We have long been measuring film metrically: 35 millimetre film, 16 millimetre film, and 8 millimetre film (Super 8).	5
(restaurant/wine)	We often order house wine in a restaurant by the litre or half litre. (See Glossary regarding spelling.)	6

	Transparency Miniature	Narration
7	(runner)	Sports enthusiasts should now be very aware of the 100, 200 or 400 metre track race.
8	(swimmer)	Or, the 100 metre swim event.
9	(newspaper article)	We often read in the newspaper about the narcotics officers confiscating a "kilo" of marijuana.
10	(pills and containers)	The pharmaceutical industry has used the metric system for years.
11	(glass of milk with nutritional value listed)	For years dieticians and home economists have been measuring in the metric system the food value and adequacy of daily diets.
12	(bill in Congress)	We are now waiting for Congress to pass the metric bill which will provide the US with a coordinated, systematic and organized conversion to a new system of measurement.
13	Get ready to . . . GO METRIC!	Meanwhile, let's get ready to. . . GO METRIC!

Transparency Miniature	Narration	
Qty Unit Symbol METRE LITRE GRAM DEGREE CELSIUS	The consumer will only have to become familiar with four of the basic units. The metre, litre, gram and degree Celsius. Study this for a moment. (hold and review with students)	14
Qty Unit Symbol ? ? ? ?	How well do you already know the 4 basic units? Test yourself. Can you fill in the blanks?	15
Qty Unit Symbol METRE LITRE GRAM DEGREE CELSIUS	Did you know all the answers? Check yourself.	16
Qty Unit Symbol etc etc etc	A mathemetician or scientist would need to know a few more metric units. The consumer, however, would rarely use these. (Study this for a moment.)	17
deci- centi- etc. milli-	To more fully understand the metric system we also need to learn some prefixes. Here are the most common prefixes that are added on to the basic units to make them smaller, or divide them into portions. (Hold and study with class.)	18
hecto- kilo- mega-	Here are the most common prefixes that are added on to the basic units to make them larger, or to multiply them into larger portions. (Hold and study with class.)	19
Prefix Unit etc	Here is the total metric language for the consumer's use. (Hold and study) . . . now let's look at one unit at a time.	20

	Transparency Miniature	Narration
21	THE METRE (metre stick next to yard stick)	The metre is slightly larger than a yard. (The metre actually is 39.4 inches long.)
22	metre 	The metre will replace conventional measures for length. These are: inch, foot, yard, mile, fathom, rod, palm furlongs, hand, cubit, nautical mile, span, etc.
23	metre x 1 000 = 1 kilometre (km) (speed sign)	The metre x 1 000 is called a kilometre (See Glossary for pronunciation)
24	(metre divided into parts)	1/10th of a metre is called a decimetre. 1/100 of a metre is a centimetre. 1/1 000 of a metre is a millimetre. (Hold and review with class.)
25	(finger)	As a point of reference, note that the width of your fingernail is approximately one centimetre.
26	(hand span)	Note also, the approximate span of your hand from the end of your thumb to the end of the little finger is approximately 20 centimetres.
27	.1 metre 1 decimetres 10 centimetres 100 millimetres	We can easily do our math problems by moving a decimal point back and forth. (Hold and review.)

Transparency Miniature	Narration	
problem: .4 metre 4 decimetres ? centimetres ? millimetres	Can you answer this problem? (Answers are 40 cm and 400 mm)	28
answers to the problem: .4 m 4 dm 40 cm 400 mm	Here are the answers.	29
1/4 yard = 3/4 foot = 9 inches	Remember when? Or, did we ever bother?	30
(girl with 36 inch bustline)	Conventionally, we referred to a bustline by the inches. Did we ever say, "She has a yard bustline"? Or, did we say, "She has a 3-foot bustline"?	31
(girl with ?? bustline)	In the metric system, the centimetre would be the most common unit used in clothing measurements.	32
metre x 1 000 = ? 1/10 metre = ? 1/100 metre = ? 1/1 000 metre = ?	Let's review the metre. (Hold and read through chart)	33
= kilometre = decimetre = centimetre = millimetre	Here are the common metre measures. (Hold and read through chart.)	34

	Transparency Miniature	Narration
35	2 THE LITRE (Litre next to a quart)	Our second unit of measure will seem easier. Let's look at the litre. The litre is slightly more than a quart. (Just enough to provide a saucer of milk for kitty -- 1/4 Cup.)
36	litre 	The litre will replace the quart, gallon, fluid ounces, bushel, peck, gill, barrel, etc.
37	(litre divided into sections)	1/10 of a litre is called a decilitre. 1/100 of a litre is called a centilitre. 1/1 000 of a litre is called a millilitre--the most common unit. (Hold and review with class.)
38	(measuring cup)	While we are converting to the metric system, the household measuring cup may look something like this.
39	1/10 litre = ? 1/100 litre = ? 1/1 000 litre = ?	Now, let's review the litre. (Hold and review.)
40	= decilitre = centilitre = millilitre	Here are the answers.
41	3 GRAM ...for mass (weight)	Our third unit of measure will be the gram. This is used for mass -- or weight. (See Glossary re: gram)

Transparency Miniature	Narration	
gram	The gram replaces the ounce, pound, ton, grain and dram.	42
1 000 grams = 1 kilogram	The gram is rather small, so we generally refer to the kilogram (1 000 grams).	43
(one pound of butter and one kilogram of butter)	One kilogram weighs slightly more than two pounds. (Actually 2.2 pounds)	44
(lady on scale smiling)	Hey, this is great! I only weigh 80 kilograms!	45
80 kg? 80 kg? ??? hint: 1 kg = 2.2 pounds	Wait a minute! If a kilogram is slightly more than double a pound, about how much does this lady weigh in pounds?	46
(lady on scales frowning) 176 pounds	Quick guessing would give us 160+ pounds. In actuality, she would weigh 176 pounds.	47
We metrically measure...	Let's review what we have learned so far. Fill in the blanks.	48

	Transparency Miniature	Narration
49	We metrically measure...	How did you do? (Hold and review with class.)
50	(picture of related metre, litre and gram)	The three units that we have just learned (metre, litre, and gram) are all related to each other in a very special way. 1 cubic centimetre = 1 millilitre and when filled with water weighs 1 gram.
51	(larger portions related)	Or, 1 cubic decimetre = 1 litre and when filled with water = 1 kilogram. (If possible, the teacher can stop here and demonstrate this fact with a clear plastic decimetre cube.)
52	4 (thermometer)	The fourth metric unit that we will learn is the degree Celsius for temperature.
53	(2 thermometers: one Celsius & and Fahrenheit)	You may formerly have known this as the Centigrade temperature. Freezing is 0° and boiling is 100°. The Celsius thermometer is divided into 100 degrees from 0 to 100. This is much easier to remember than 32° Fahrenheit for freezing. and 212° Fahrenheit for boiling!
54	(child with thermometer)	Normal body temperature is 37° Celsius! (Remember 98.6 Fahrenheit?)
55	(thermometer with labeled temperatures)	We will just have to become familiar with the different temperatures. For example, our normal body temperature is 37° Celsius, a comfortable room temperature would be 20°, and a warm, sunny beach day might be 25° Celsius.

Transparency Miniature	Narration	
5 JOULE	One additional metric unit of measure with which the consumer should be familiar is the joule. (See Glossary)	56
A diet with a Caloric value of 2,000 is approx equal to a diet with an energy value of 8 000 kilojoules. Ratio: 1:4 approx Ratio: 1:4.2 actuality	The joule in the System of International Units would replace the Calorie. (Hold and review with class.)	57
(picture of fat person stuffing self with R_x note for 4 000 kilojoule diet.)	When dieting, don't get carried away when told to use a 4 000 kilojoule diet! This is the same as a 1,000 Calorie diet.	58
Basic Units ✓ Prefixes ✓ Rules	We now know the basic units of the metric system and the prefixes. Now we must learn some rules in writing metrics.	59
NO: ~~14 cm.~~ YES: 14 cm	First of all, use no periods after the symbols.	60
NO: ~~14 cms~~ YES: 14 cm	When writing plural measurements, never use an "s" after the symbol. The number itself indicates that it is plural.	61
NO: ~~14 CM~~ YES: 14 cm HOWEVER YES TO: C for Celsius	The symbols should be in lowercase except for those designated. (See Glossary)	62

	Transparency Miniture	Narration
63	NO: 14,000 km YES: 14 000 km	Commas should be omitted in figures representing large amounts as the comma in some countries is interpreted as a decimal point. Instead, we are encouraged to leave a space.
64	(speed sign 90 km/hour)	How will all this affect us? Can you imagine going 90 km/hour on the freeway?
65	(gas 13¢/litre)	Can you imagine paying only 13¢ a litre for gas?
66	(Bright, sunny day; person looking through window with ???)	Can you imagine the weatherman saying, "Enjoy your sunny, warm 25° weather tomorrow"?
67	(sick person)	Can you imagine the doctor saying, "You have a temperature of 39° C! You're really sick"?
68	(fabric and zipper)	Can you imagine buying 2 metres of fabric and a 20 centimetre zipper for your new dress?
69	(picture of girl)	Can you imagine having body measurements of 87-65-92?

Transparency Miniature	Narration	
(picture of boy and girl)	Can you imagine weighing only 50 kg?	70
(baby announcement)	Can you imagine receiving a birth announcement reading: New Baby Boy Weight: 3.1 kg Length: 49 cm	71
HAPPY METRICATION! Transparencies and script presented by Orange County Department of Education.	HAPPY METRICATION!	72

SI *

SYSTÈME INTERNATIONAL

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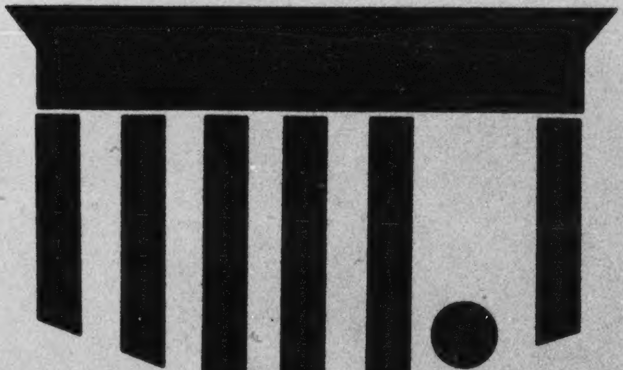
Système International d'Unités, or

International System of Units



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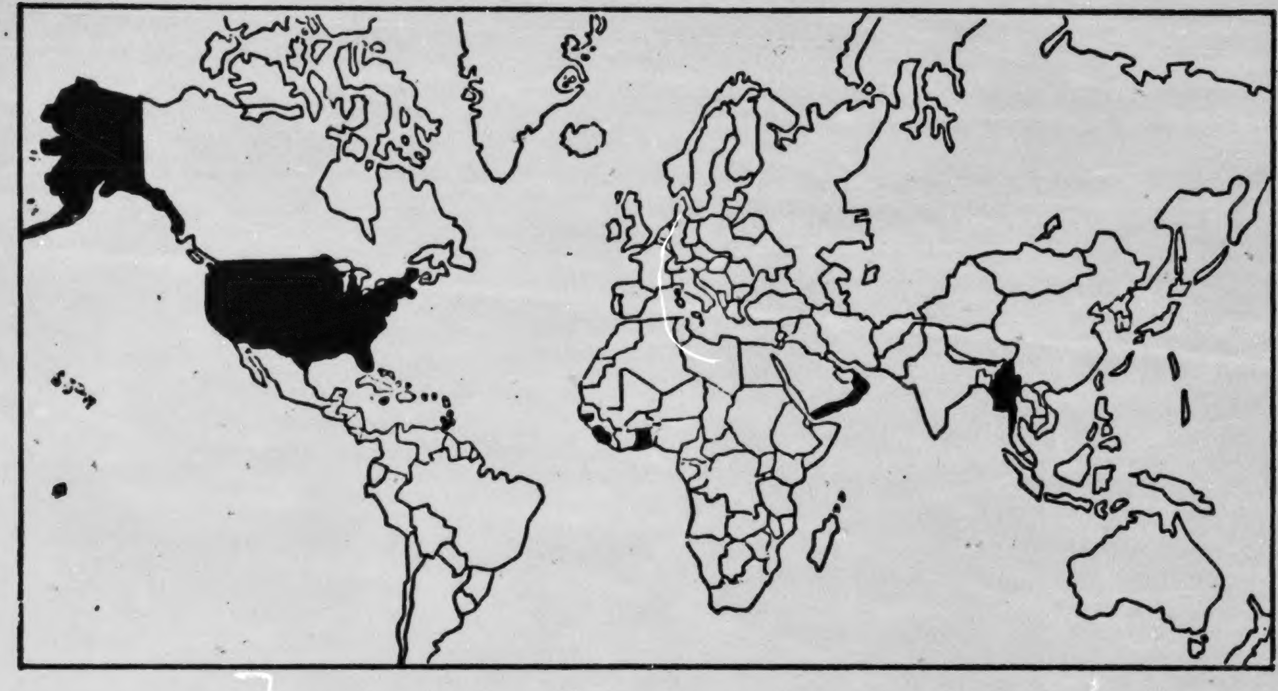

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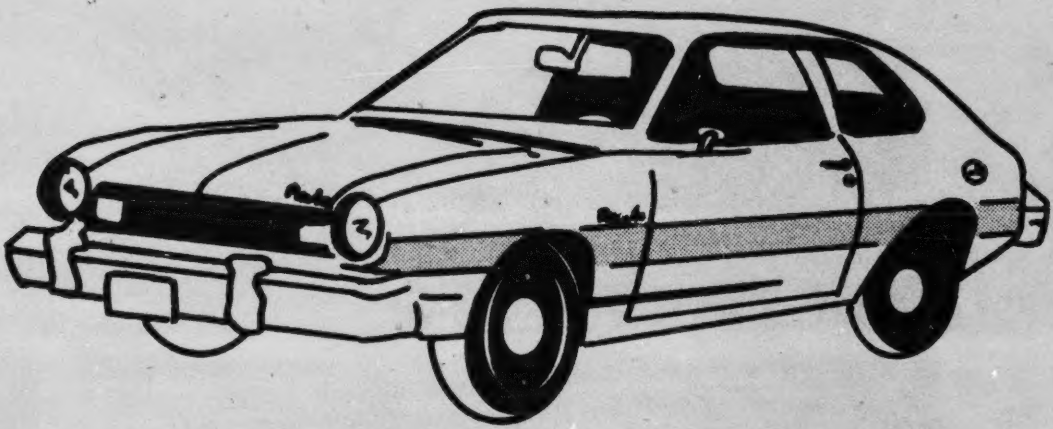

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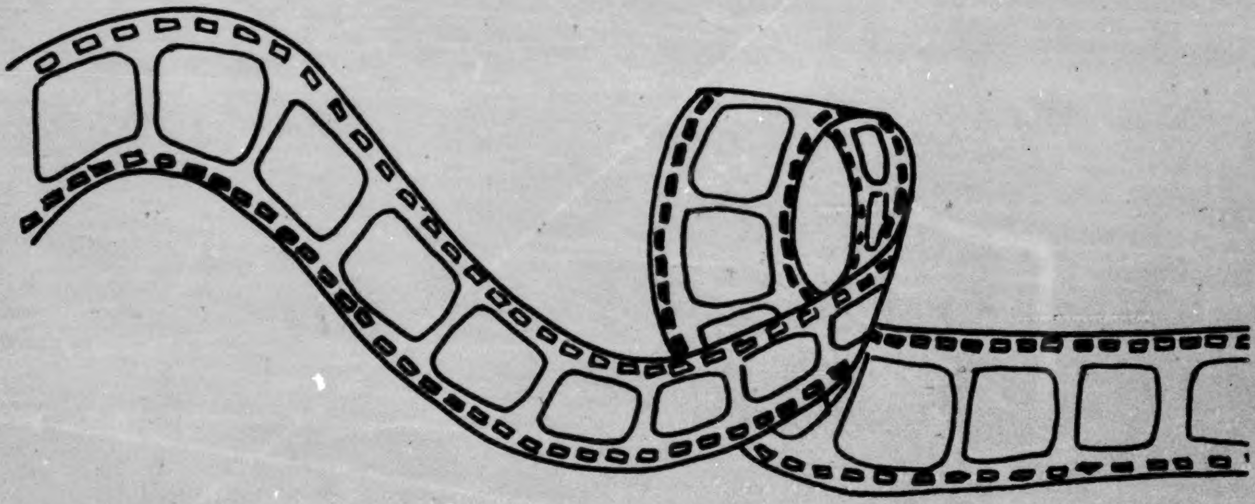

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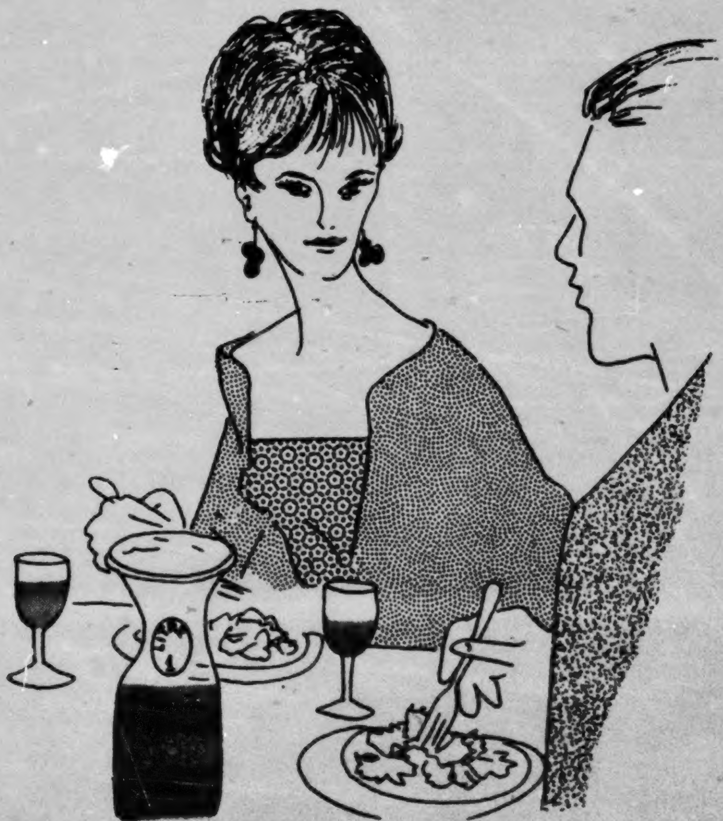

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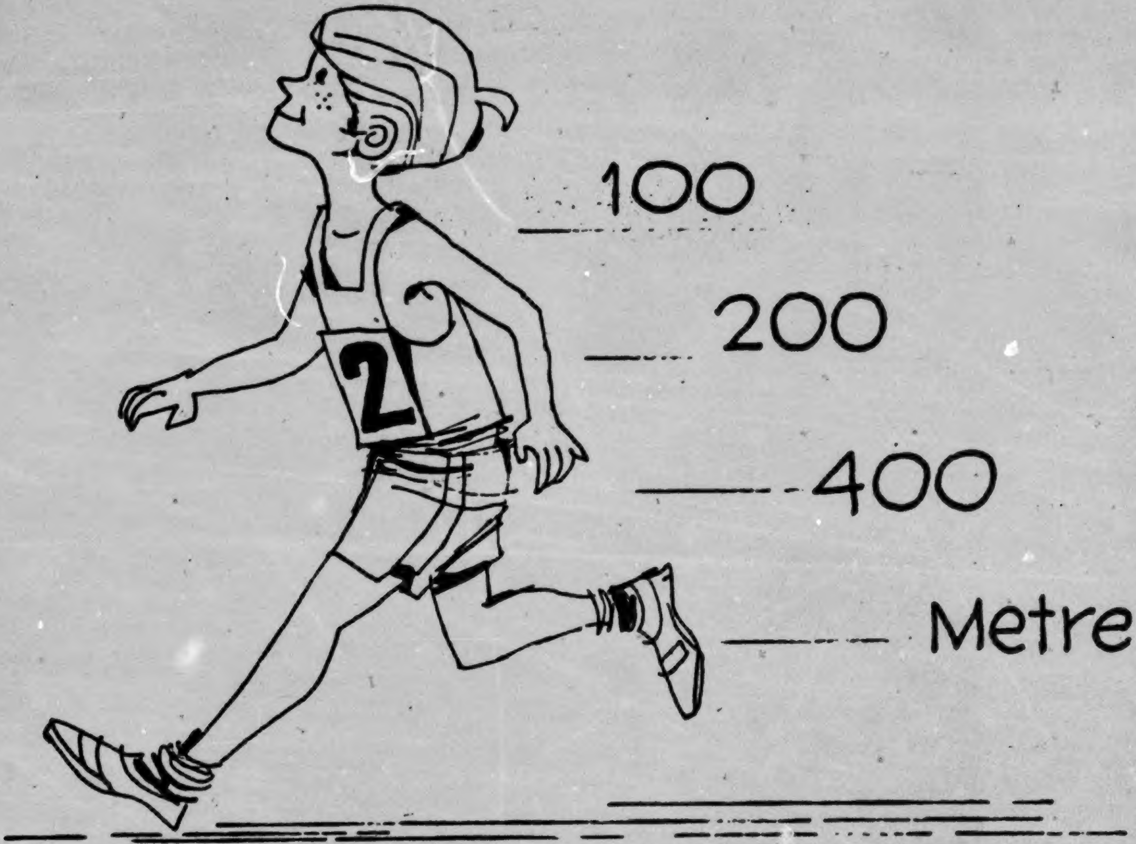
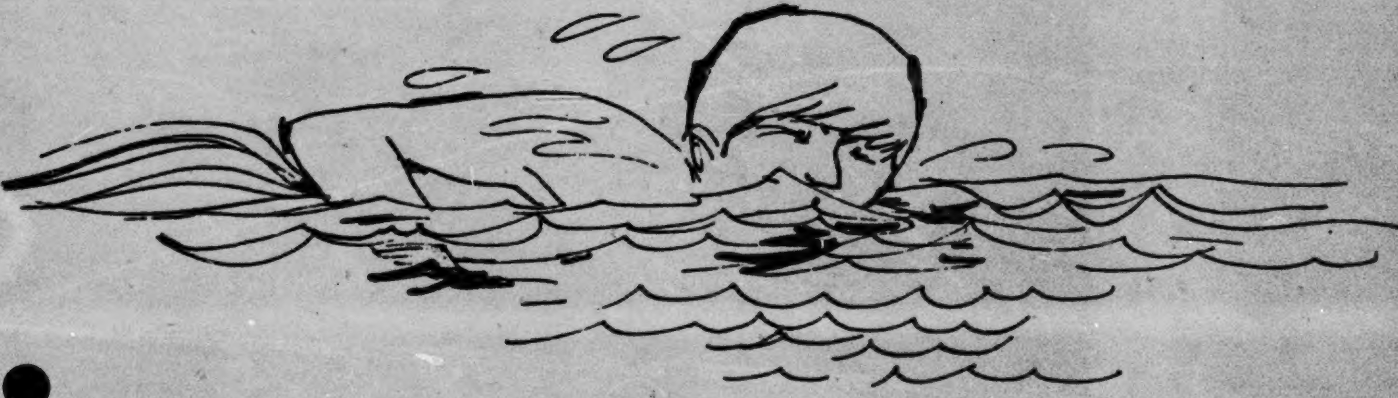

100
200
400
Metre
2

8

100 Metre Swim Event



POLICE FIND 1 KILO OF MARAJUANA

"CHILDREN HAVE to have some kind of guidance—that's the primary reason to say 'No' to them. They need to be out of your hair; you need to be able to get them to accept some limitations, and you need to protect them and demonstrate your love for them. All these needs and many more are incorporated in the ability to say 'No.' "

The speaker was Dr. Edwin S. Kessler, director of Children's Psychiatric Services at Georgetown University Medical Center in Washington, D.C. His eyes were warm and knowing behind the glasses, and his moustache and thinning hair helped to reinforce the psychiatrist's father-figure image.

"Take guidance," he continued. "The idea is to establish a set of rules that can be followed not only as a child, but later on as well. For the most part, I would say almost any child who is not given some limits, who is not helped by a judicious 'No,' is going to become undisciplined, wild, aggressive—and frightened. He doesn't know where to draw the line. A child whose instincts are permitted full sway is likely to be a terrified child. He shows signs of extreme anxiety because somehow he knows that if his parents can't help him control his impulses, *he* certainly can't. To learn some kind of control over his own strong inner impulses he must get assistance from his parents. This assistance comes by defining limits, and you define limits by saying 'No.' "

"How do you know which approach you're taking?" I asked. "Where do you draw the line between his needs and your own convenience?"

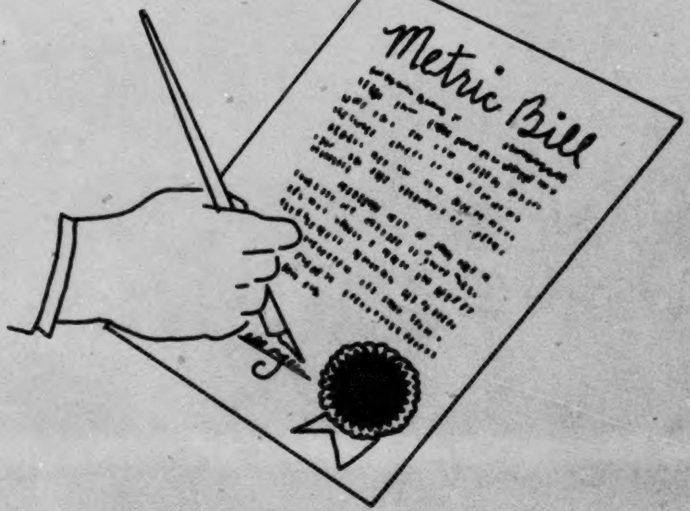
"A lot of it, of course, is common sense, and the culture helps a lot," Dr. Kessler replied. "There are certain standard things, sets of behavior that require a 'No' because the culture has established both the action and the time at which it takes place. 'No, you cannot continue to soil your diapers.'

11

1 GLASS OF WHOLE MILK (210 g) CONTAINS:

7.4 g	Protein
8.2 g	Fat
10.3 g	Carbohydrate
0.25 g	Calcium
0.20 g	Phosphorus
0.2 mg	Iron
0.08 mg	Thiamine
0.36 mg	Riboflavin
0.21 mg	Niacin
2.1 mg	Vitamin C

12



13

GET READY TO...

GO METRIC

14

QUANTITY	UNIT	SI SYMBOL
Length	metre	m
Volume	litre	l
Mass (Weight)	gram	g
Temperature	degree Celsius	°C

15

QUANTITY	UNIT	SI SYMBOL
Length	____________	m
Volume	____________	l
Mass (Weight)	____________	g
Temperature	____________	°C

16

QUANTITY	UNIT	SI SYMBOL
Length	metre	m
Volume	litre	l
Mass (Weight)	gram	g
Temperature	degree Celsius	°C

17

QUANTITY	UNIT	SI SYMBOL
Length	metre	m
Volume (Liquid)	litre	l
Mass (Weight)	kilogram	kg
Time	second	s
Electric Current	ampere	a
Temperature	Celsius	C
Luminous Intensity	candela	cd
Amount of Substance	mole	mol

18

PREFIXES TO MAKE THEM smaller

PREFIX	QUANTITY	CLUE TO REMEMBER
deci-	(1/10th or 0.1)	The decimal system based on tens
centi-	(1/100th or 0.01)	The cent
milli-	(1/1 000th or 0.001)	The millipede

prefixes TO MAKE THEM LARGER

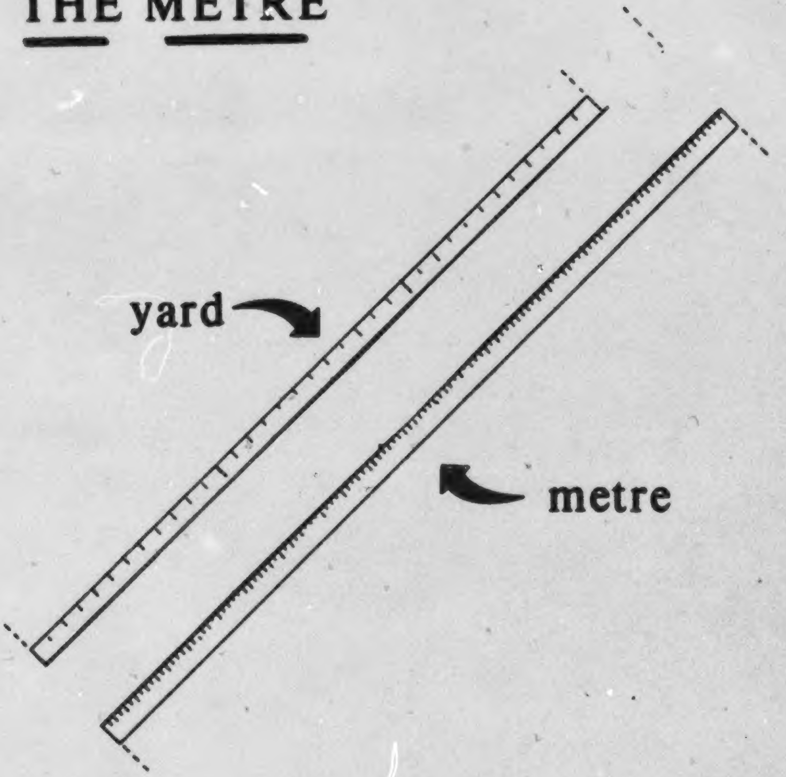
hecto-	x 100
kilo-	x 1 000
mega-	x A million

PREFIX	SYMBOL
mega-	M
kilo-	k
hecto-	h
deci-	d
centi-	c
milli-	m

UNIT	SYMBOL
metre	m
gram	g
litre	l

1

THE METRE

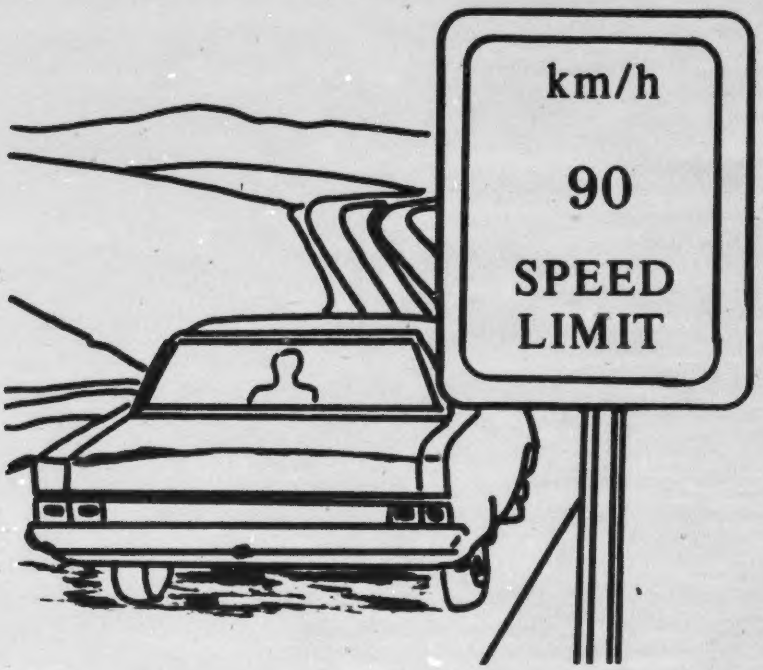


METRE REPLACES

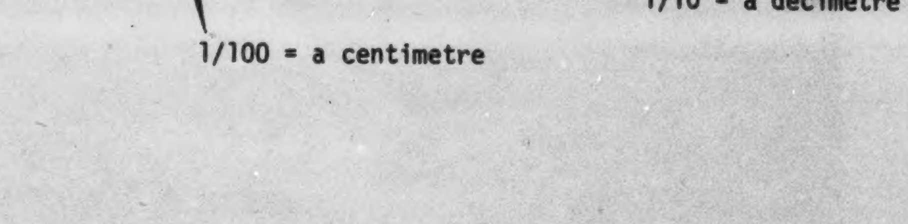
- INCH
- FOOT
- YARD
- MILE
- FATHOM
- MILE
- ROD
- CUBIT
- FURLONGS
- SPAN
- ETC.

23

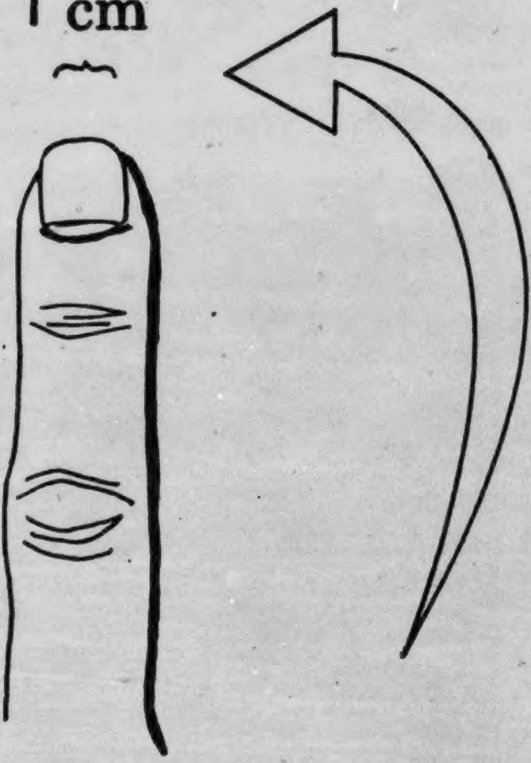
metre x 1 000 = 1 kilometre (km)


km/h
90
SPEED
LIMIT

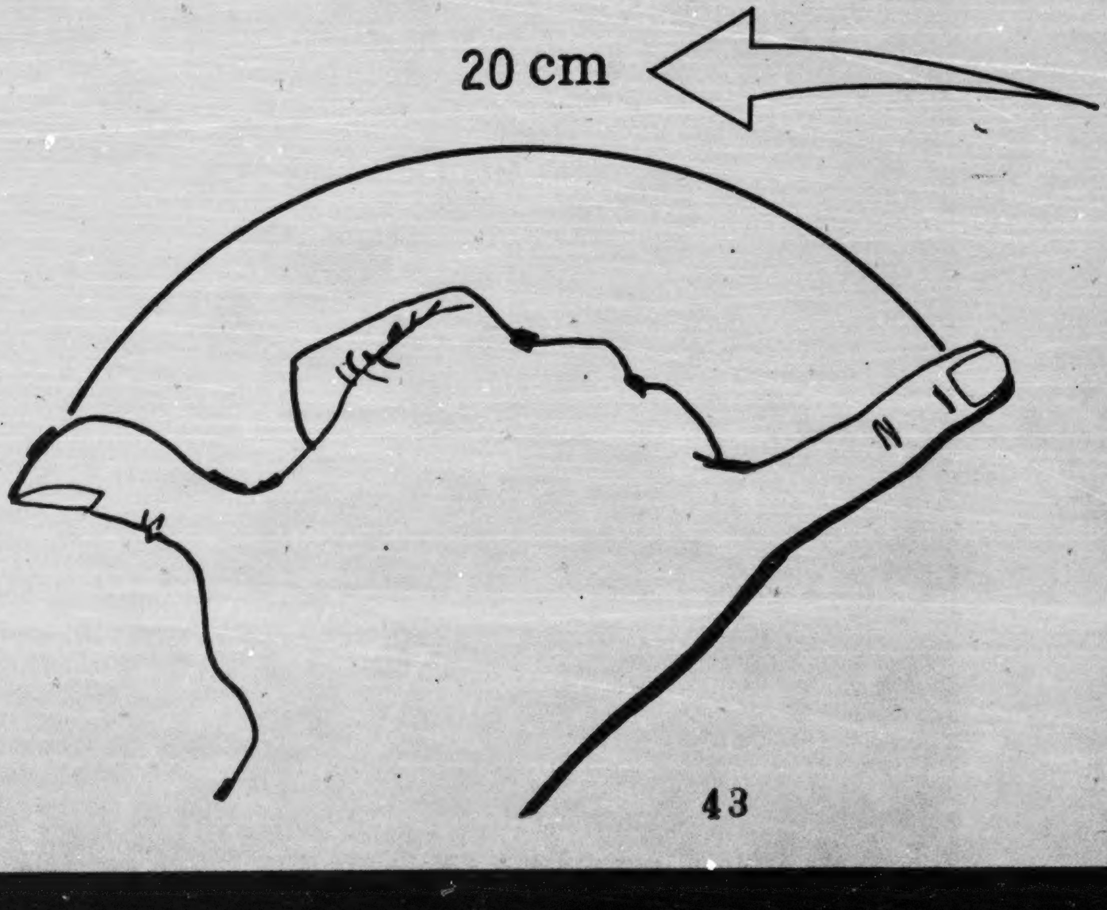
24


METRE
1/10 = a decimetre
1/100 = a centimetre

25

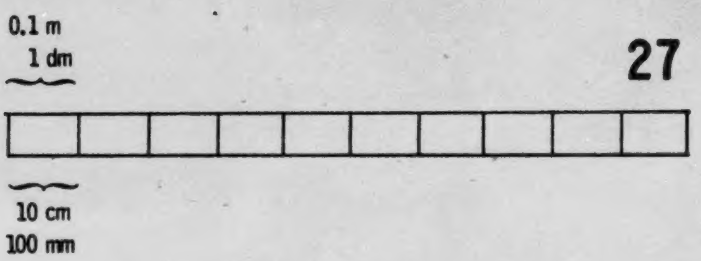


26



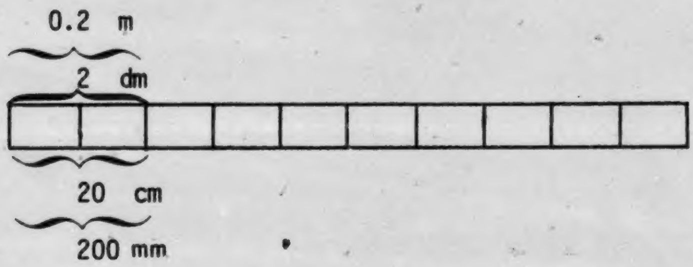
27

0.1	metre
1.0	decimetre
10.0	centimetres
100.0	millimetres


0.1 m
1 dm
10 cm
100 mm

EXAMPLE:

0.2	metre
2.0	decimetres
20.0	centimetres
200.0	millimetres


0.2 m
2 dm
20 cm
200 mm

28

PROBLEM:

0.4 metre

4.0 decimetres

= ______ centimetres

= ______ millimetres

29

ANSWERS: .4 metre
= 4 decimetres
= 40 centimetres
= 400 millimetres

30

REMEMBER WHEN . . .

1/4 yard
= 3/4 foot
= 9 inches

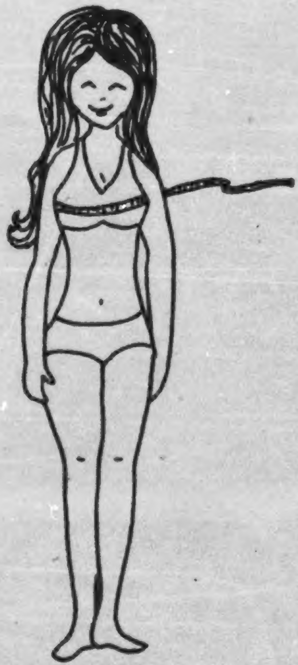
31

36 inches

3 feet

1 yard

32



0.9 metre

9.1 decimetres

91 centimetres

910 millimetres

REVIEW:

metre x 1 000 = ________

0.1 or 1/10 metre = ________

0.01 or 1/100 metre = ________

0.001 or 1/1 000 metre = ________

ANSWERS:

metre x 1 000 = kilometre

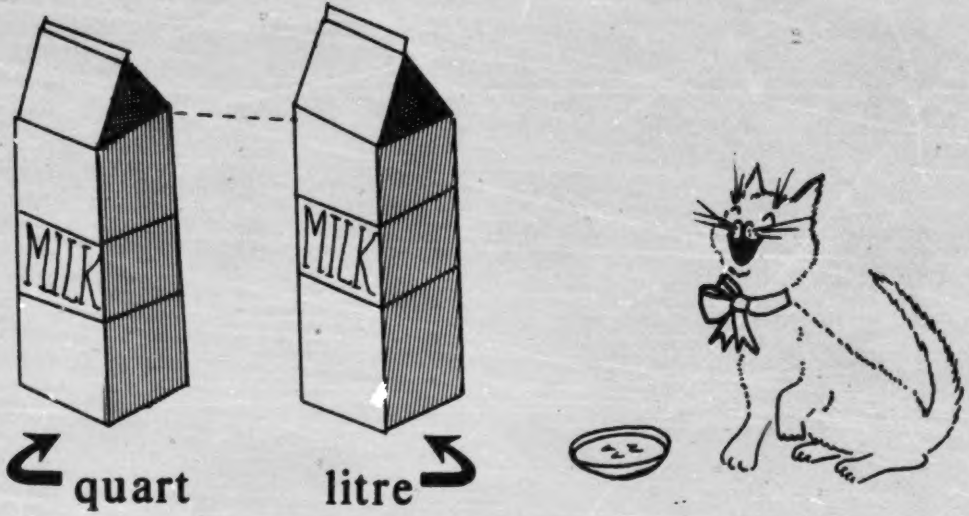
0.1 or 1/10 metre = decimetre

0.01 or 1/100 metre = centimetre

0.001 or 1/1 000 metre = millimetre

.2

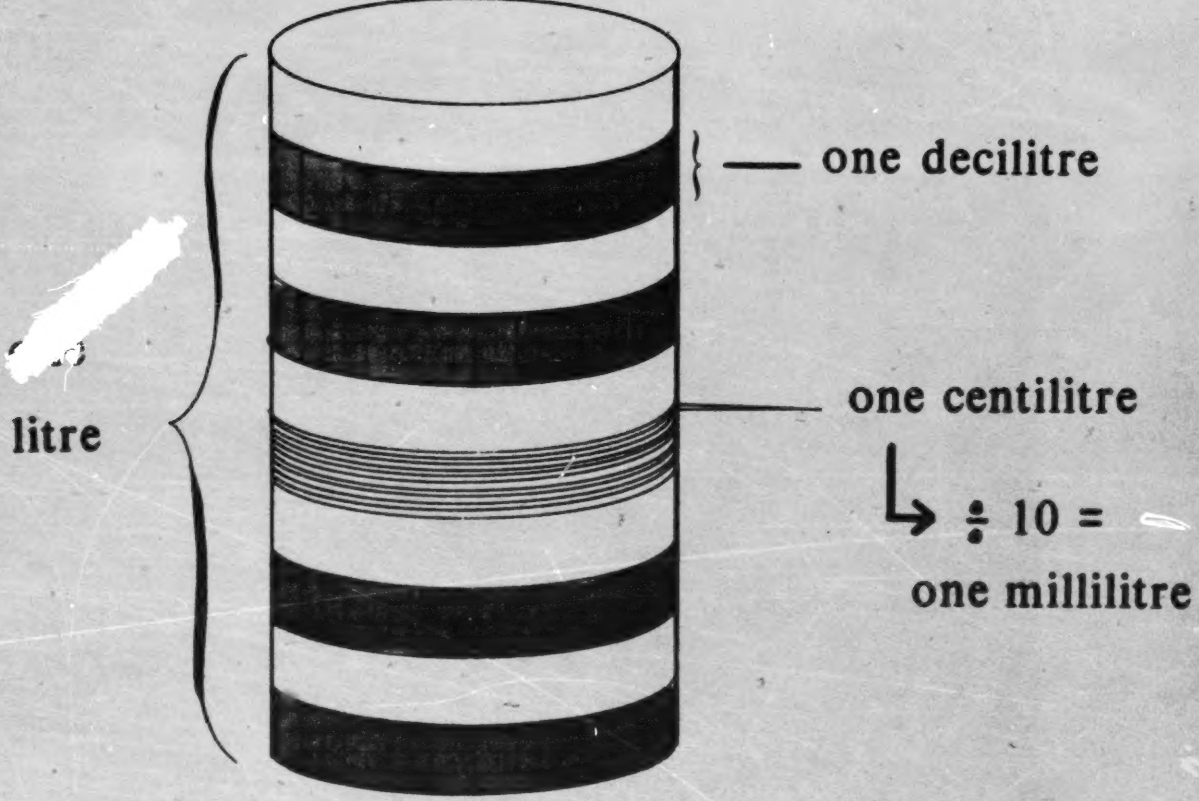
THE LITRE


MILK
MILK
quart
litre

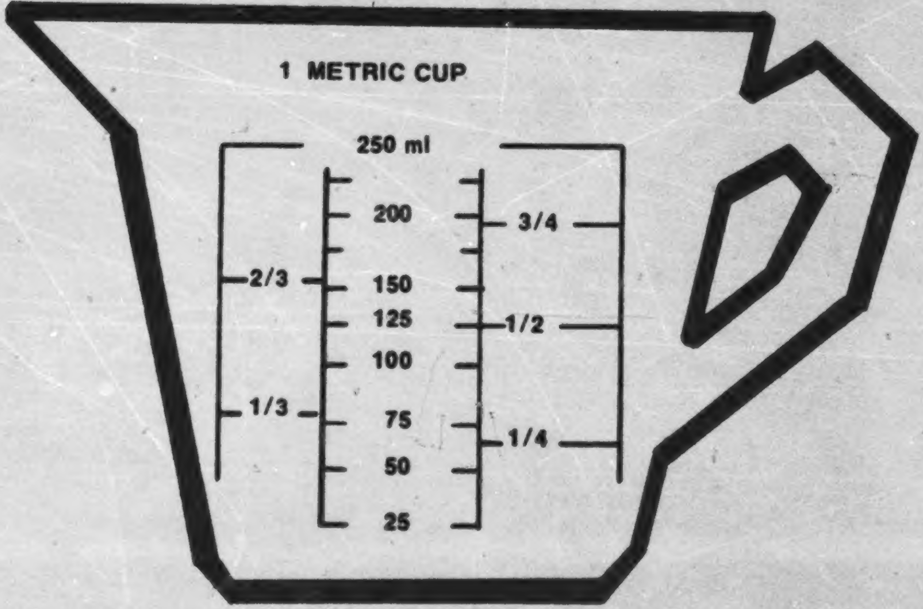
LITRE
REPLACES

QUART
GALLON
FLUID OUNCE
ETC.

37


one decilitre
litre
one centilitre
÷ 10 =
one millilitre

38


1 METRIC CUP
250 ml
200
3/4
2/3
150
125
1/2
100
1/3
75
1/4
50
25

REVIEW:

1/10 litre = ________

1/100 litre = ________

1/1 000 litre = ________

ANSWERS:

1/10 litre = decilitre

1/100 litre = centilitre

1/1 000 litre = millilitre

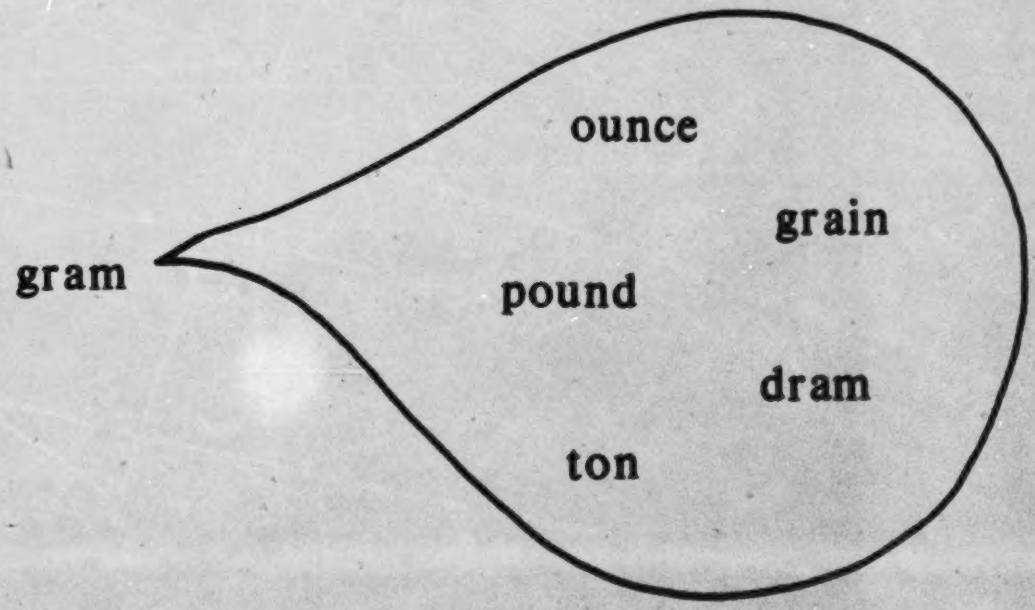
3

41

GRAM

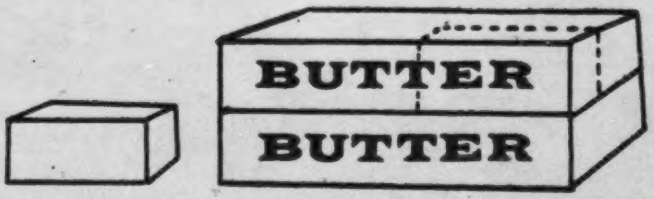
. . . for mass
or weight

42

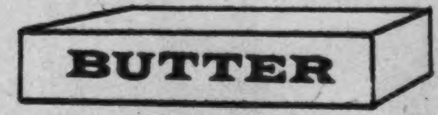

gram
ounce
grain
pound
dram
ton

1 000 grams = 1 kilogram

1 000 g = 1 kg

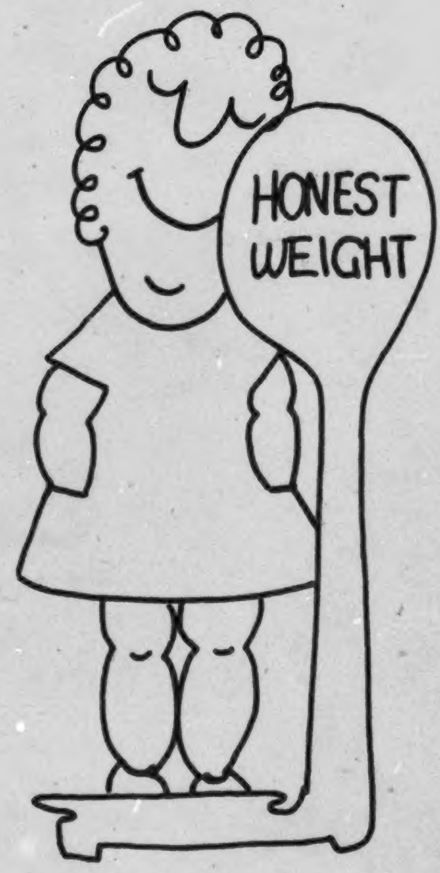

BUTTER
BUTTER

1 kilogram



1 pound

45


HONEST
WEIGHT

80 kg

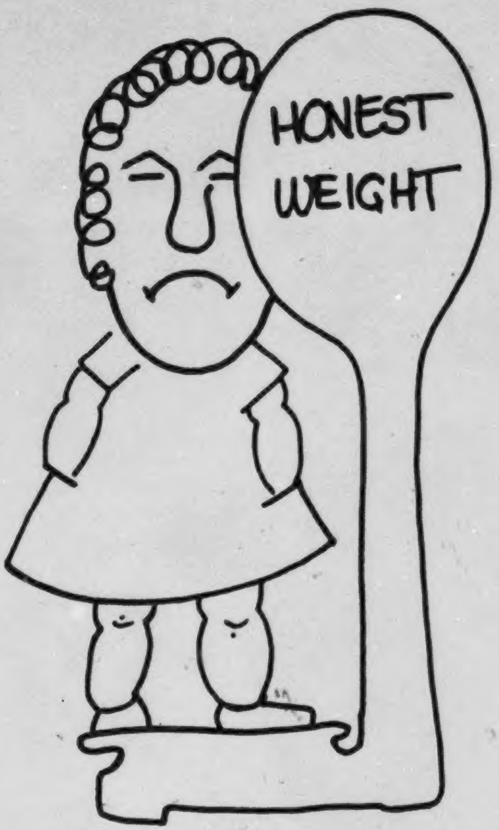
46

80 kg

80 kg

HINT: 1 kg = 2.2 pounds

47



QUICK GUESS =

160+ pounds

ACTUALITY =

176 pounds

48

REVIEW:

We metrically measure . . .

length by using the ____________,

volume, or liquid, by using the ____________,

and mass, or weight, by using the ____________

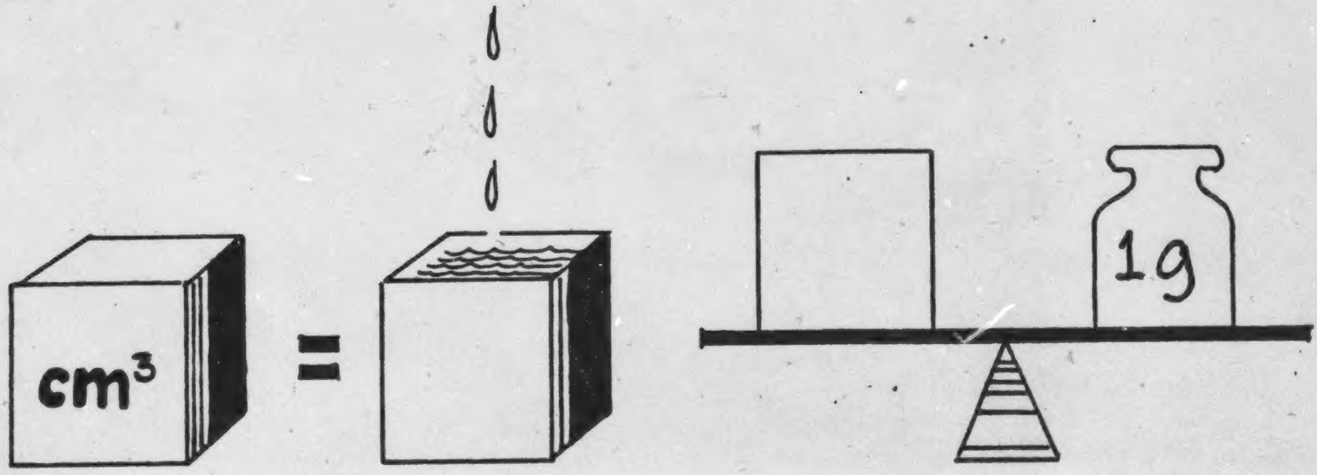
or __________.

49

ANSWERS:

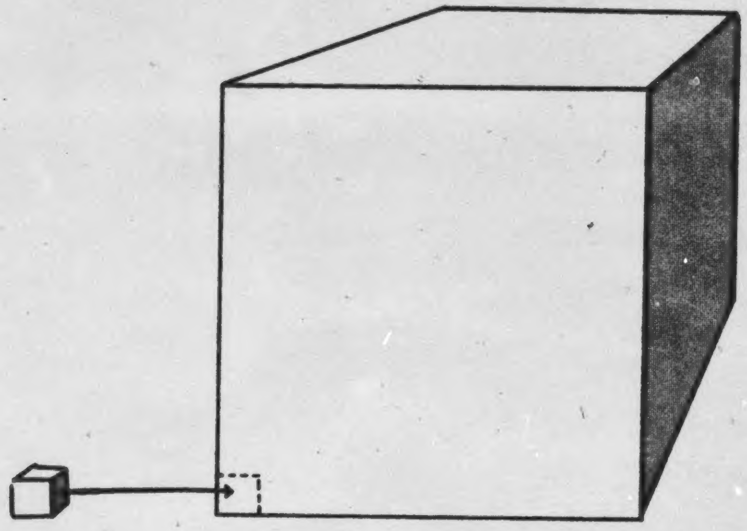
We metrically measure . . .
length by using the metre,
volume, or liquid, by using the litre,
and mass, or weight, by using the gram
or kilogram.

50



1 cubic centimetre = 1 millilitre = 1 gram of water

51



(1 cubic centimetre)

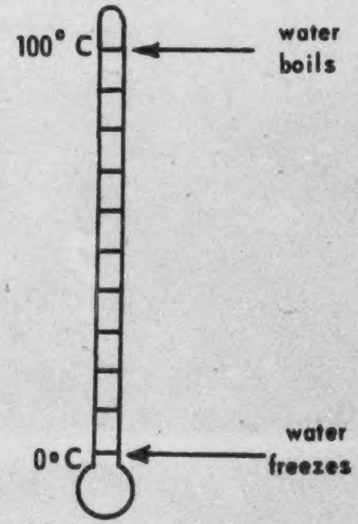
1 cubic decimetre = 1 litre and when filled with water weighs 1 kilogram

---

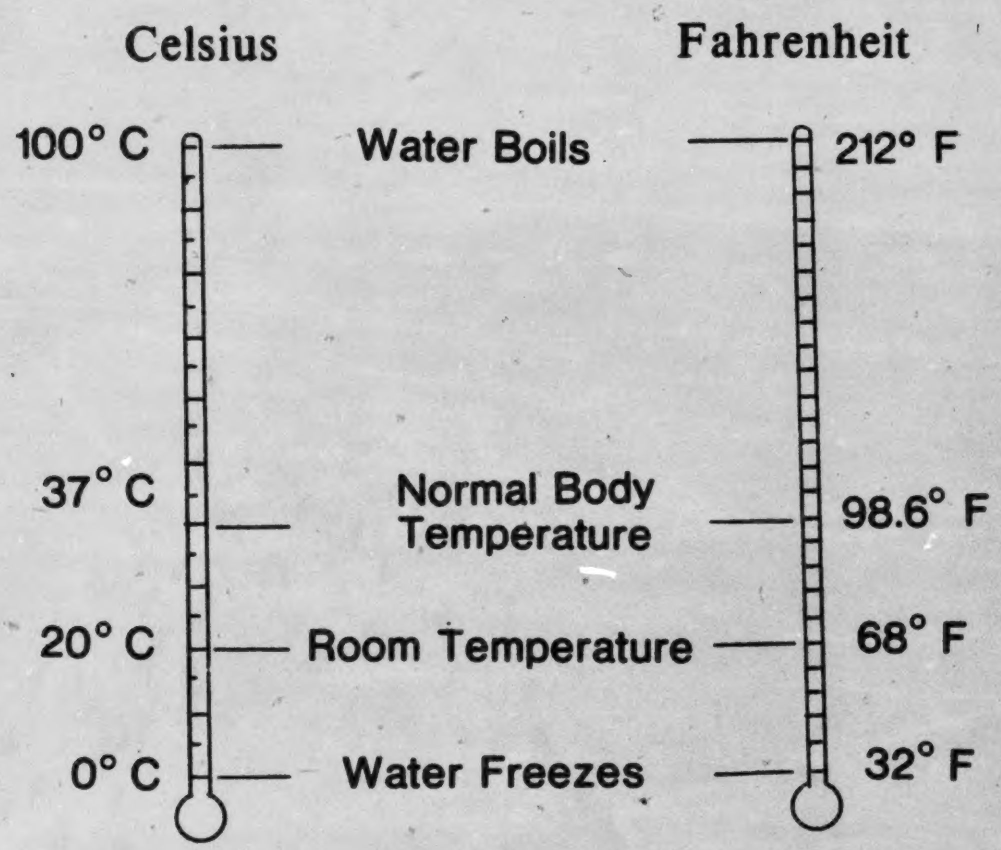
52

4

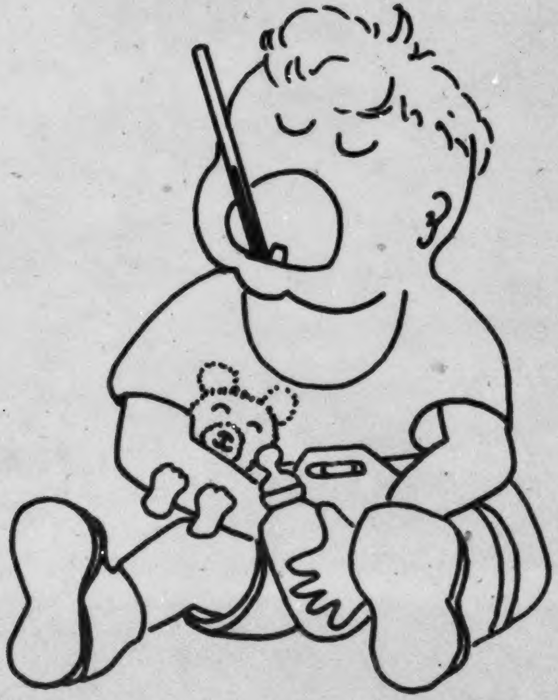
CELSIUS


100° C
water boils
0°C
water freezes

53


Celsius
Fahrenheit
100° C
Water Boils
212° F
37° C
Normal Body Temperature
98.6° F
20° C
Room Temperature
68° F
0° C
Water Freezes
32° F

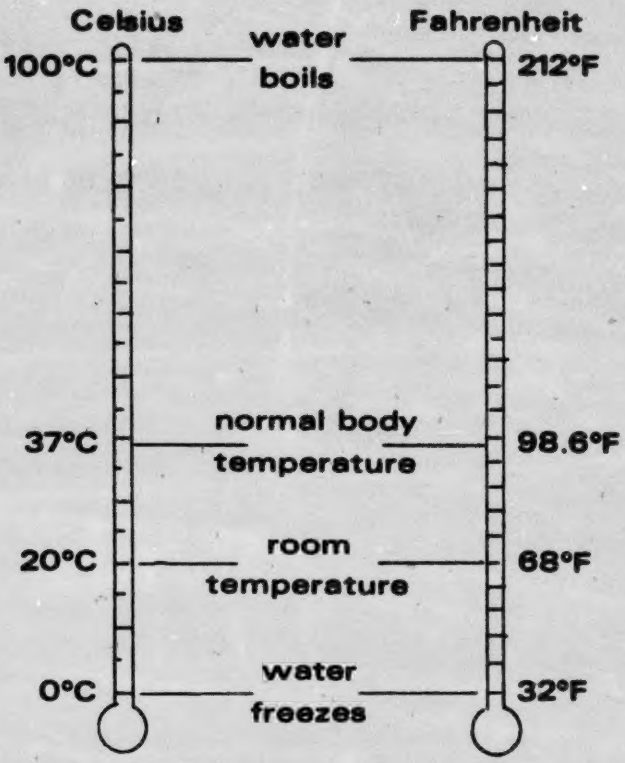
54



37° Celsius

= Normal temperature

(or 98.6° Fahrenheit)


Celsius
Fahrenheit
100°C
water boils
212°F
37°C
normal body temperature
98.6°F
20°C
room temperature
68°F
0°C
water freezes
32°F

5

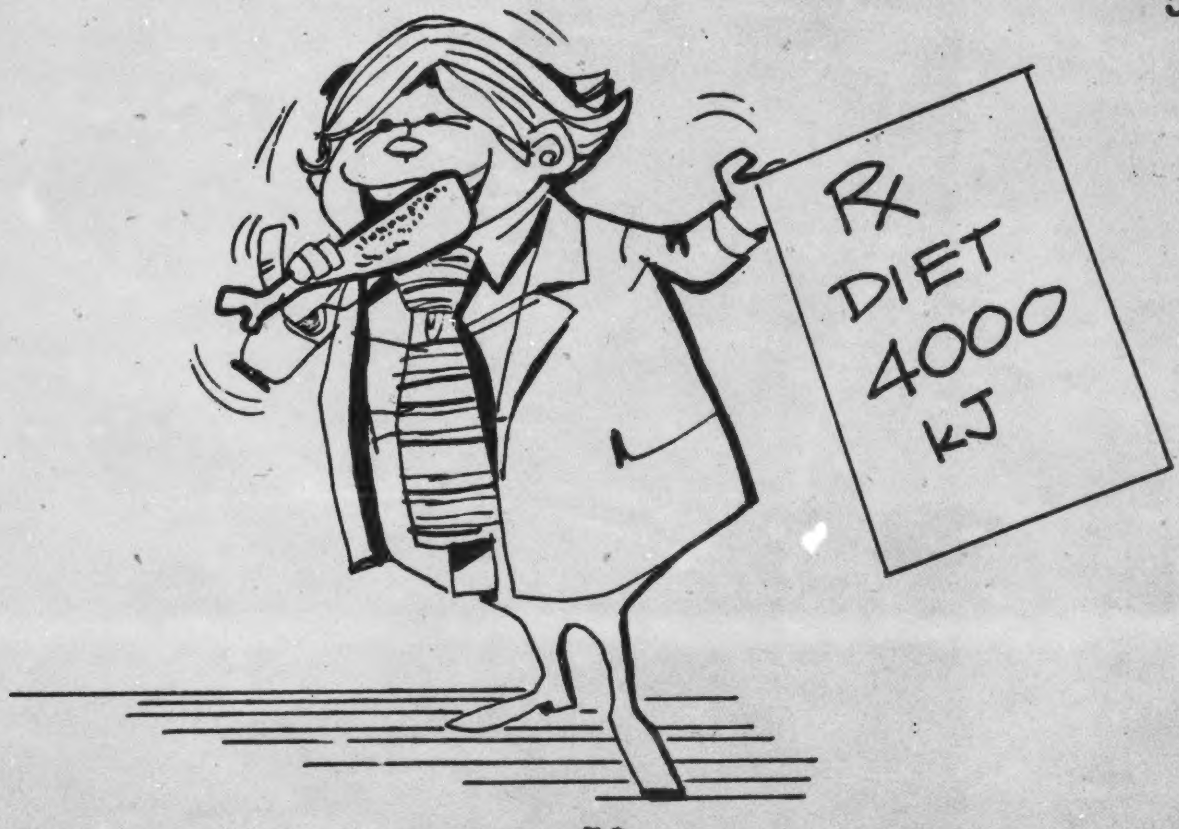
JOULE

57

A diet with a caloric value of 2,000 is approximately equal to a diet with an energy value of 8 000 kilojoules.

Ratio:	1.4	approximately
	1:4.2	actuality

58



BASIC UNITS ✓

PREFIXES ✓

RULES

NO: ~~14 cm.~~

YES: 14 cm

USE NO PERIODS AFTER SYMBOLS AND ALWAYS LEAVE A SPACE BETWEEN THE NUMBER AND THE METRIC SYMBOL

NO: ~~14 cms~~

YES: 14 cm

NEVER USE AN "S" AFTER A SYMBOL.

NO: ~~14 CM~~

YES: 14 cm

THE SYMBOLS SHOULD BE IN LOWERCASE EXCEPT FOR THOSE DESIGNATED.

(However, yes to: C for Celsius)

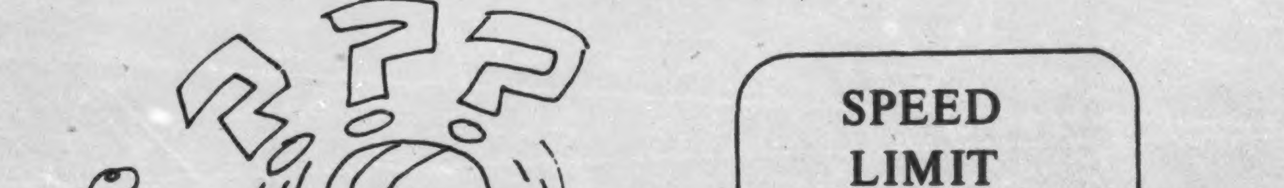
63

NO: ~~14,000~~ km

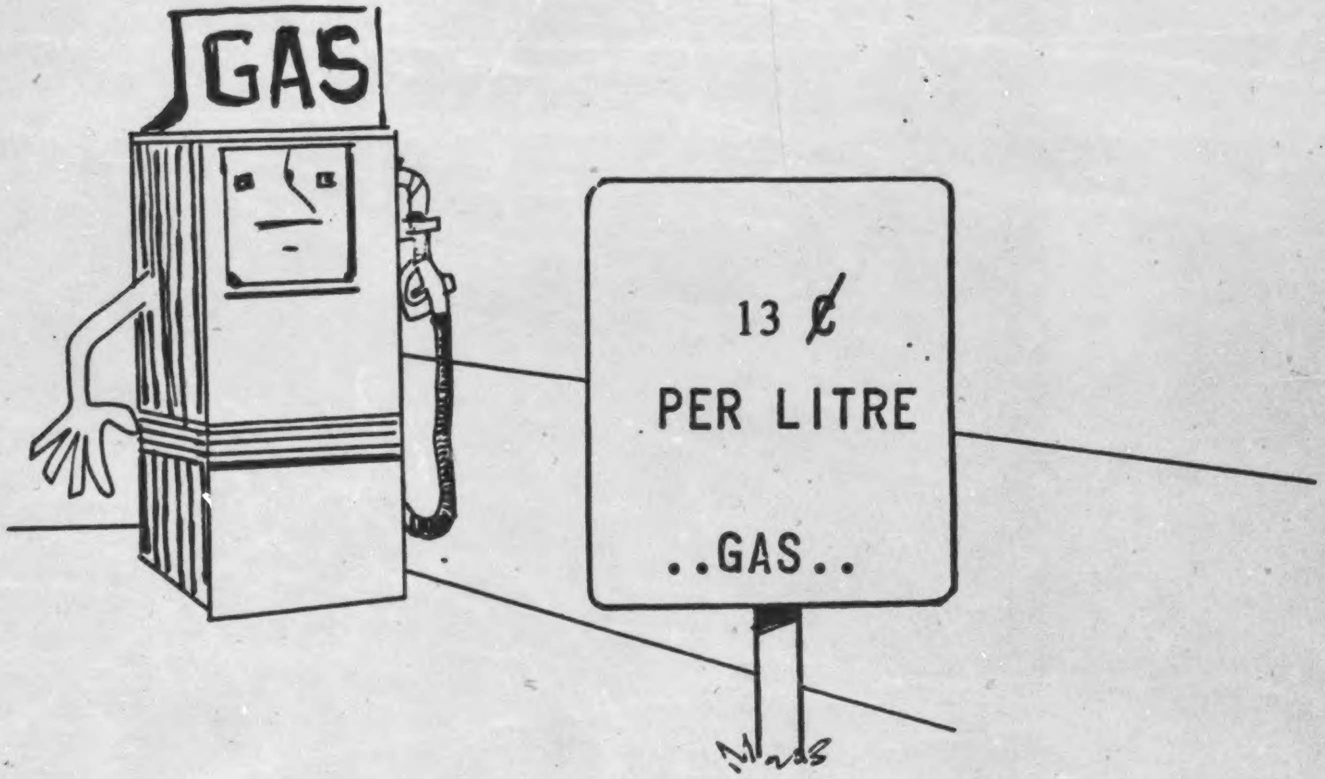
YES: 14 000 km

COMMAS SHOULD BE OMITTED IN FIGURES REPRESENTING LARGE AMOUNTS.

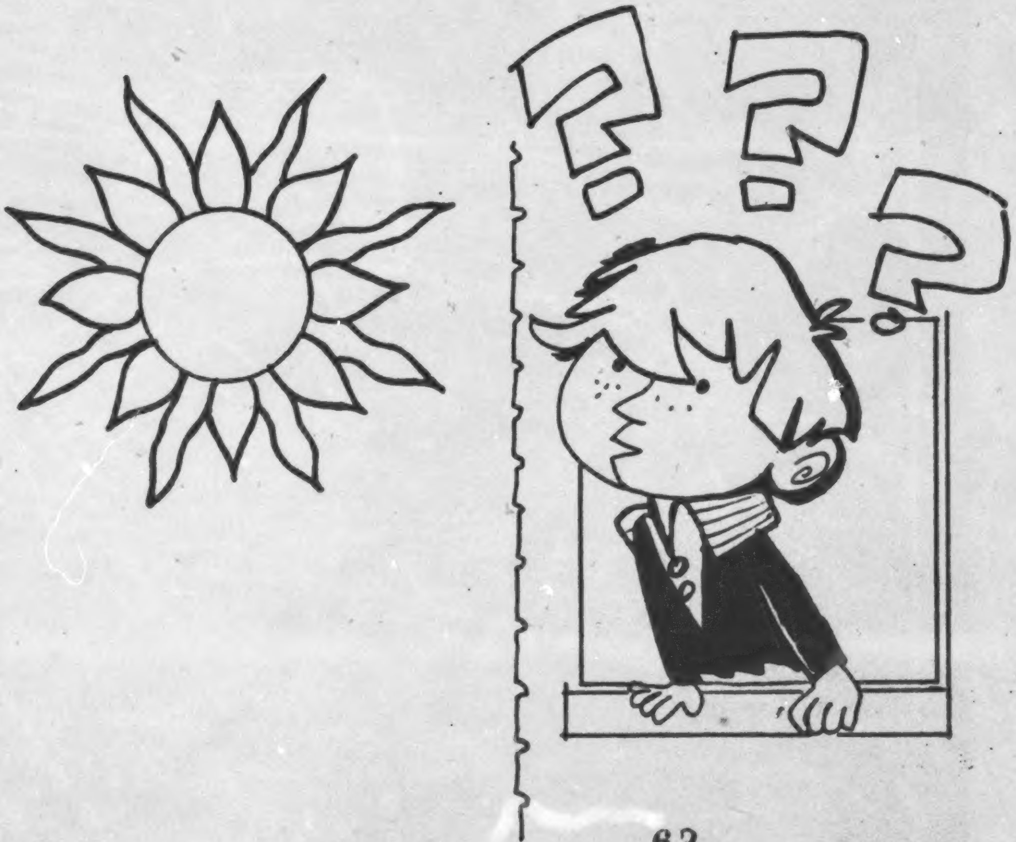
64


SPEED
LIMIT
90
km/h

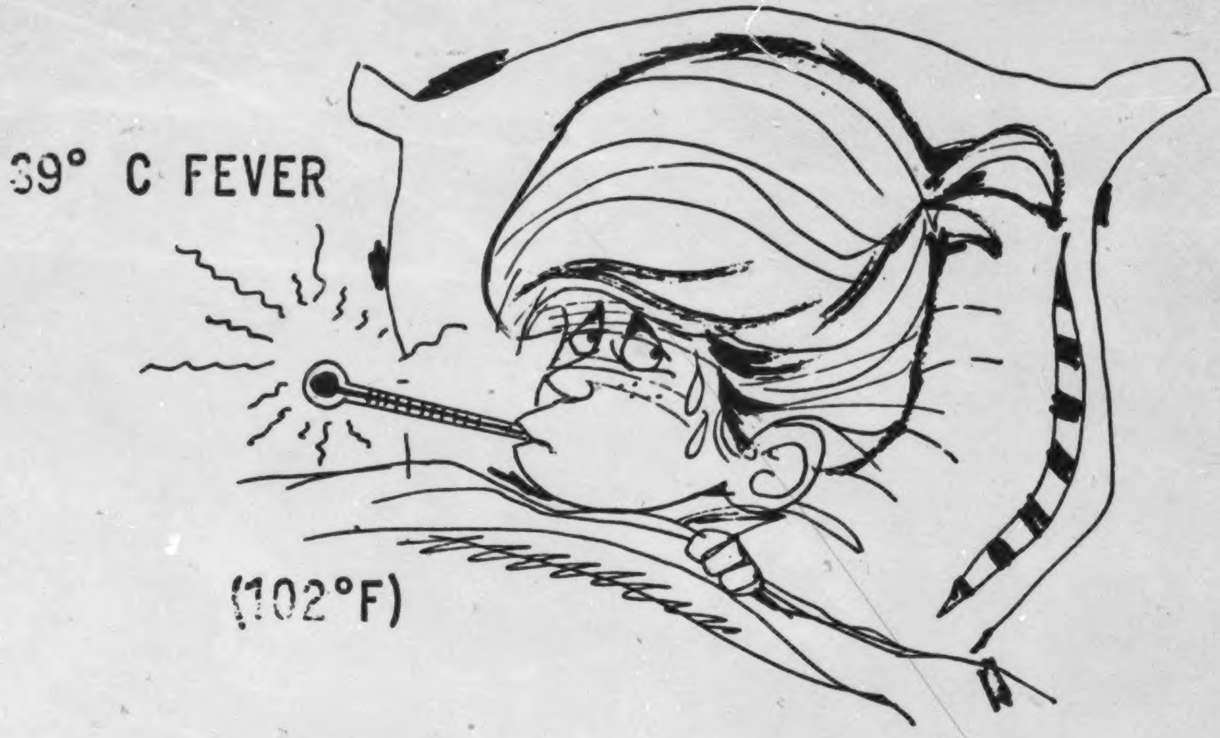
65


GAS
13 ¢
PER LITRE
..GAS..

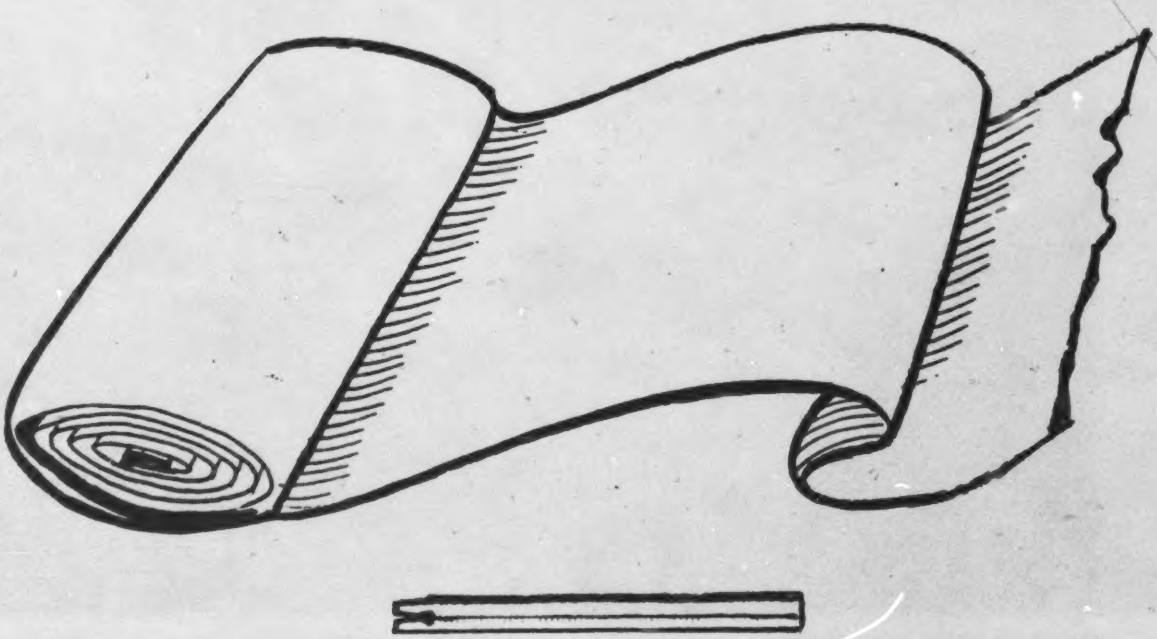
66



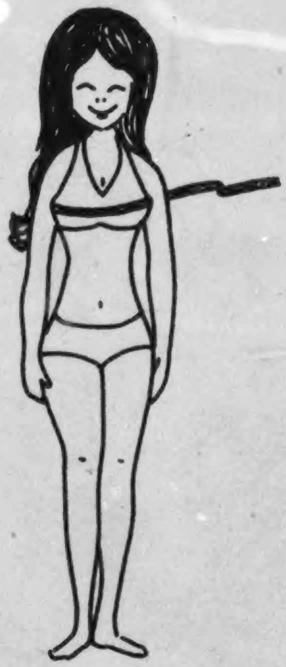
67


39° C FEVER
(102°F)

68



69

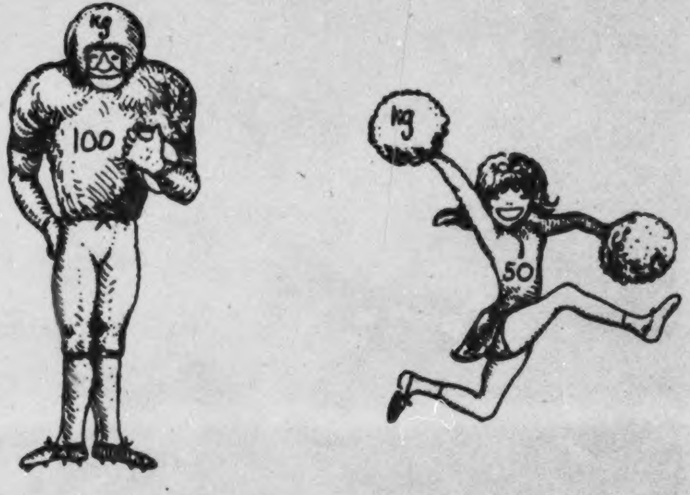


BUST 87 cm

WAIST 65 cm

HIPS 92 cm

70

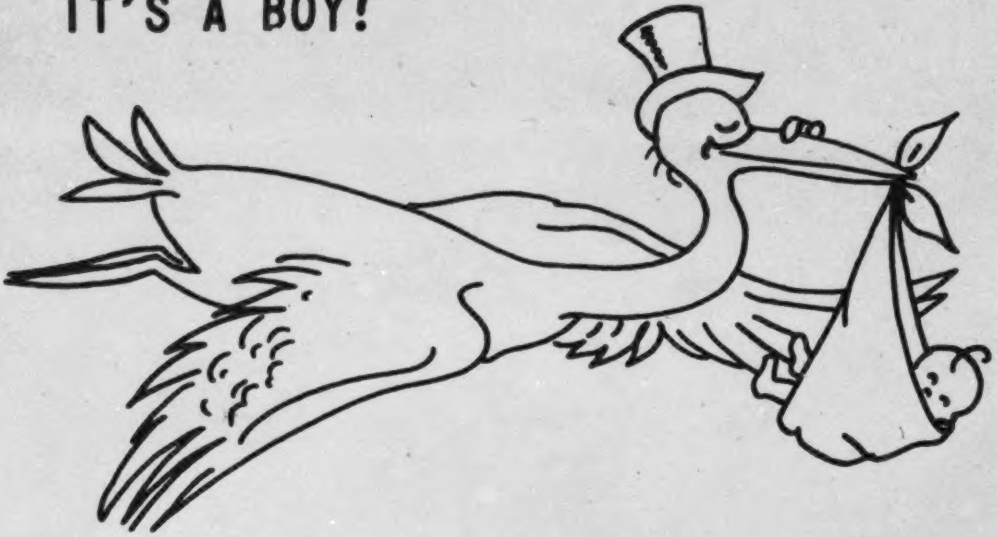


100 kilograms

50 kilograms

71

IT'S A BOY!



WEIGHT: 3.1 kg

LENGTH: 49 cm

72

Happy metrication!

Transparencies and script

presented by

Orange County Department of Education

1974

PART III: LEARN BY DOING

INSTRUCTIONS TO TEACHER

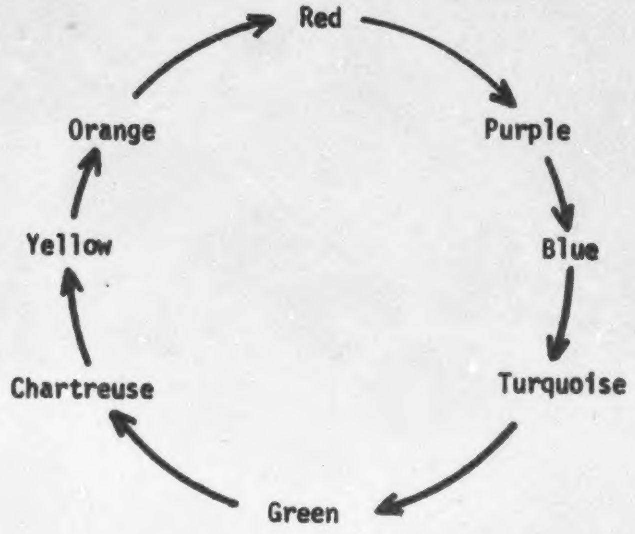
- ▶ The "learn-by-doing" session may be preceded by some examples of the various experiments.

- ▶ Distribute color chips to divide participants into 8 groups. A paper placement of colors can identify the various stations.

LEARN BY DOING

As each participant in today's workshop entered the door, he/she received a color coded tag. The color received will indicate the station in which to begin participation in the "round robin" presentation of activities.

The following will be the direction of progress in the "round robin":


Red
Purple
Blue
Turquoise
Green
Chartreuse
Yellow
Orange

Information will be available at each station. With no further instructions, please begin!

STATION: RED -- "BODY MEASUREMENTS"

Supplies at the station:

-CHEA personal measurement cards
-tape measures (3)
-height chart on wall
-box for leveling height
-bathroom scale
-question box

Steps:

1. Using the CHEA personal measurement card provided, fill in the blanks as to height, weight, and body dimensions as indicated.

2. Answer: I am _____ cm tall
_____ dm tall
_____ m tall

Example: I am 164 cm
16.4 dm
1.64 m

Which of the above measurements would become the most commonly used? __________

3. My bust/chest measurement is _____ mm
_____ cm
_____ dm
_____ m

Which measurement would become most commonly used? __________

4. Have you ever considered a 3-foot bustline or a yard bustline?

YES _____ NO _____

STATION: PURPLE -- "VOLUME"

Supplies at the station:

-metric measuring cups (3)
-full, capped Coke bottle
-empty Coke bottle (3)
-litre wine flask
-large container with "?"
-tea cup (1)
-drinking glass (1)
-large container for water (or sink)
-question box

Steps:

1. Fill the measuring cup with 100 ml. Pour this into the empty Coke bottle.

   Now estimate with your eye how many ml in the full Coke bottle?
   __________ ml

2. To check your estimate, fill the empty Coke bottle until it is even with the full, capped bottle. Pour the water back into the measureing cup to measure the contents of the bottle.

   What are the actual contents of the Coke bottle? __________ ml

   How far off was your guess? __________ ml

3. In measuring typical servings, decide upon an amount which could be used in centilitres for the tea cup. Attempt to use whole numbers.

   __________ ml = an average tea cup serving

4. In measuring typical servings, decide upon an amount which could be used in centilitres for the drinking glass. Attempt to use whole numbers.

   __________ ml = an average drinking glass serving.

5. Fill the wine flask with exactly one litre.

   By visualizing what one litre "looks like", attempt a guess for the contents in the large container marked "?".

   Write your guess here: __________ml
   A prize will be given later for the closest guess!

STATION: BLUE -- "WEIGHING FOOD"

Supplies at the station:

-metric scale for measuring (1)
-bag of potatoes
-4 bananas
-question box

Steps:

1. Approximately how many potatoes weigh 1 kg? __________

2. What is the average weight of one potato? __________ g
(hint: Weigh 3 potatoes and divide by 3.)

3. At the grocery store the potatoes are marked:

20¢/kg
Potatoes

How much would 500 g of potatoes cost? __________ ¢

How much would 250 g cost? __________ ¢

Weigh 6 potatoes. Approximately how much would they cost? $ __________

4. How much does one banana weigh? __________ g or __________ kg

5. How many bananas would it take to weigh 1 kg? (est.) __________

STATION: TURQUOISE -- "GROCERY ITEMS"

Supplies at the station:

-grocery item A: large package of raisins marked "net wt. 15 oz."
small package of raisins marked "net wt. 1½ oz."

-grocery item B: large package of raisins re-marked "net wt. 400 g"
small package of raisins re-marked "net wt. 40 g"

-miscellaneous empty containers of grocery items
-question box

Steps:

1. On grocery item A, please figure the unit price according to customery measures. (price per ounce)

What is the price per ounce of the large package? ________ ¢

What is the price per ounce of the small package? ________ ¢

Which was the better buy? ________

2. On grocery item B, please figure the unit price according to metric measures. (price per gram)

What is the price per gram of the large package? ________ ¢

What is the price per gram of the small package? ________ ¢

Which was the better buy? ________

3. Which system was easier to use? ________

4. Observe the grocery items. They are listed conventionally as well as metrically. List the different units that you found. Then decide why each unit was used for the item.

UNIT	REASON
________	________________________
________	________________________
________	________________________

STATION: ORANGE -- "ACCURACY OF METRICS"

Supplies at the station:

- -metric scale
- -flour
- -dry measuring cups
- -sifter
- -metal spatulas
- -wax paper
- -dampened dish cloth
- -large spoons
- -question box

Steps:

1. Measure and weigh 1 cup of flour by the following methods:

   (a) Scoop flour out of canister with measuring cup, level off and weigh.

   1 cup flour weighs _________ g

   (b) Sift flour onto wax paper, spoon lightly into the cup, level and weigh.

   1 cup flour weighs _________ g

   (c) Sift flour directly into the cup (hold over a piece of wax paper to catch spillage), level and weigh.

   1 cup flour weighs _________ g

2. Did the three measurements differ in weight? The difference between the lowest and the highest weight was:

   Highest weight = _________ g
   - Lowest weight = _________ g
   = Difference = _________ g

3. Compare the results of method 1(b) of measurement obtained by other participants:

   Participant 1: _________ g
   Participant 2: _________ g
   Participant 3: _________ g

   The difference between the lowest and highest value was _________ g.

4. What conclusions can you make regarding chances of error in various recipes?

STATION: GREEN -- "GARMENT CONSTRUCTION"

Supplies at the station:
-pattern envelope in metrics
-pattern piece
-question box

Steps:

1. What is the metric seam allowance on the pattern piece? ________ cm

Had you ever noticed that designation on a pattern before? ________

According to the pattern envelope, answer the following questions:*

2. The basic metric unit for measuring length is the ______________ .

3. What are the body measurements for a size 12?

_________cm, _________cm, and _________cm

4. What are the standard fabric widths listed?

_________cm, _________cm, _________cm, and _________cm

5. The finished length of the pants at the side seam of a size 10 would be _________ cm.

6. For a size 12 you would need _________ cm of 2 cm wide elastic.

7. What could you make from this pattern with a 150 cm^2 (or 1.5 square metre) piece of fabric?

__________________________________ (size _______)

---

*These questions were contributed by Lynda Monroe Ellingson, student, California State University, Long Beach.

STATION: YELLOW -- "TEMPERATURE"

Supplies at the station:

-4 thermometers (range of 0° C to 200° C)
-oven set at 350° F
-bowl of ice water
-pan with boiling water
-empty bowl at sink
-question box

Steps:

1. The oven has heated to 350° F. Take the temperature with the Celsius thermometer.

   The temperature read _________° C.

2. Place a thermometer in the ice water. The temperature reads ______° C.

3. The temperature of the tap water on "cold" at the sink is _________° C.

4. Run the water to become lukewarm. Test with your finger. It should feel just barely warm to the touch.

   The temperature is now _________° C.

5. The water that is boiling (full boil) measures _________° C.

STATION: CHARTREUSE -- "LENGTH"

Supplies at the station:
- -cookie sheet
- -3 metre sticks
- -question box

Steps:

1. Make your own "body ruler":

Which of your fingernails is almost 1 cm wide? ____________________

How far is your span between the end of your thumb and the end of your little finger? __________ cm

Extending your arm out, from the tip of your middle finger, where does a metre measure on you?

Check:
____ To your nose (facing forward)?
____ To your opposite ear?
____ To your opposite shoulder?
____ Other ________________________

Measure the length of your pace (average step). Measure from the back of your heel on each step. My pace is __________________ cm.

2. Using your "body ruler" estimate the size of the cookie sheet.
__________ x __________ cm

3. Using the metre stick, what is the average working height of a table where you would be sitting? __________ cm

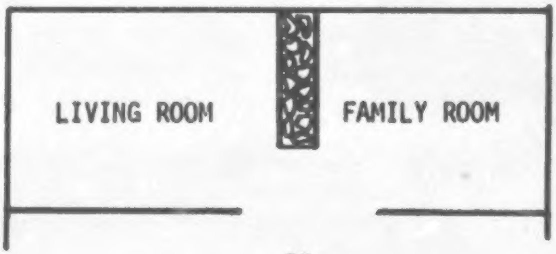
4. What is the chair's sitting height? __________ cm

5. Measure the counter height? __________ cm

6. The following floor plan has a scale of 1 cm = 1 m.

What are the measurements of the living room? __________ m x __________ m

How many square metres of carpet would you order for the family room?
__________ m^2



CONCLUSION OF "LEARN BY DOING"

1. Answer the questions which have been collected at each station in the question boxes.

2. Give the prize to the person who made the closest guess as to volume of the "?" container.

3. Distribute the post-test.

METRIC POST-TEST

Attempt to answer the questions without any aids the first time through. Then, you may consult your workshop papers to aid you in answering the following questions:

1. The basic metric unit used in measuring length is the __________.
2. The basic metric unit used in measuring mass (weight) is the __________ or __________.
3. The basic metric unit used in measuring volume (liquids) is the __________.
4. The metric degree of temperature is called __________.
5. To divide any of the basic units into 100 sections, the prefix __________ is used.
6. To divide any of the basic units into 1 000 sections, the prefix __________ is used.
7. To multiply a basic unit by 1 000, we use the prefix __________.
8. Driving distance would be measured by __________.
9. The approximate distance from the tip of your thumb to the tip of your little finger is __________ cm.
10. Using your "body rulers" the width of this paper is approximately __________ cm.
11. Normal body temperature is __________° C.
12. How much did you weigh? __________ kg
13. How tall were you? __________ cm
14. What is the seam allowance on a pattern? __________ cm
15. What is comfortable room temperature? __________° C

PART IV: REFERENCE MATERIALS

GLOSSARY AND ANNOTATIONS

ADDITIONAL CLASSROOM ACTIVITIES

- BULLETIN BOARDS
- CHALKBOARD STATEMENTS
- CLASSROOM ACTIVITIES

CONVERSION CHARTS AND OTHER REFERENCES

SOURCE OF METRIC SUPPLIES

BIBLIOGRAPHY

GLOSSARY AND ANNOTATIONS

Calorie vs. kilojoule	The International System of Units considers it preferable to adopt the joule and avoid the use of the calorie. Watch for further guidance on this matter!
calorie:	The calorie is the amount of heat required at a pressure of one atmosphere to raise the temperature of one gram of water one degree Celsius.
Calorie:	(With a capital C, or the kilocalorie) The Calorie is the amount of heat required to raise the temperature of one kilogram of water one degree Celsius. (This is the unit of common usage with the consumer.)
joule:	(Unit of energy or work) The joule is the amount of work done when an applied force of 1 newton moves a body through a distance of 1 metre in the direction of force.

Conversion Aids:

1 calorie = 4.186 joule

1 Calorie (or kilocalorie) = 4 186 joule or 4.186 kilojoule

For consumer use:

1 Calorie = 4.186 kilojoule

gram	Since the unit "gram" is so small, the official basic unit for mass is the "kilogram." It is easier to understand the prefixes when the gram is introduced as the basic unit (as was done in this manual).
kilometre	It is recommended at this time that the accent fall on the first syllable to be consistent with other metric terms. (kil'-oh-meet-er)
liter or litre? meter or metre?	There is a growing trend to spell the words in the international manner: litre and metre. Watch for official direction on this matter.
mass vs. weight	Weight differs as a result of gravity, but mass is consistent. Both a brick and a feather would be weightless in space, but you could still trip over the brick!

GLOSSARY AND ANNOTATIONS - continued

Uppercase Symbols: The metric symbols are generally given in lowercase letters. The following are the symbols for commonly used units that are exceptions to the rule:

A	ampere	W	watt
K	kelvin	J	joule
°C	degree Celsius	V	volt

* * *

HISTORICAL ENGLISH TERMS AND EQUIVALENTS

- the Biblical cubit = the length of a man's forearm.
- the Egyptian digit = the width of a finger.
- the rod = 5-1/2 yards or 16-1/2 feet. In the 16th century, the length of a rod was determined by lining up 16 men, left-foot-to-left-foot, as they left church on Sunday morning.
- the inch = the length of three barley corns, round and dry, taken from the center of the ear and laid end-to-end.
- the foot = 2/3 of the original cubit (see cubit above).
- the English furlong = 40 rods long (see rod above). The furlong was used in farming.
- the English yard = the distance from the point of the nose to the end of the thumb of King Henry I. Later Henry VII ruled the yard to be 3 feet.
- the English fathom = the length across a man's two arms outstretched. The fathom was used in sailing.

BULLETIN BOARD IDEA

SOME COMMON UNITS

LENGTH	MASS	VOLUME	TEMPERATURE	ELECTRIC CURRENT	TIME
METRIC					
metre	kilogram	litre	Celsius (centigrade)	ampere	second
CUSTOMARY					
inch foot yard fathom furlong cubit rod	ounce pound ton gram dram	fluid ounce teaspoon tablespoon cup pint quart gallon barrel peck bushel	Fahrenheit	ampere	second

BULLETIN BOARD IDEA - REVISED

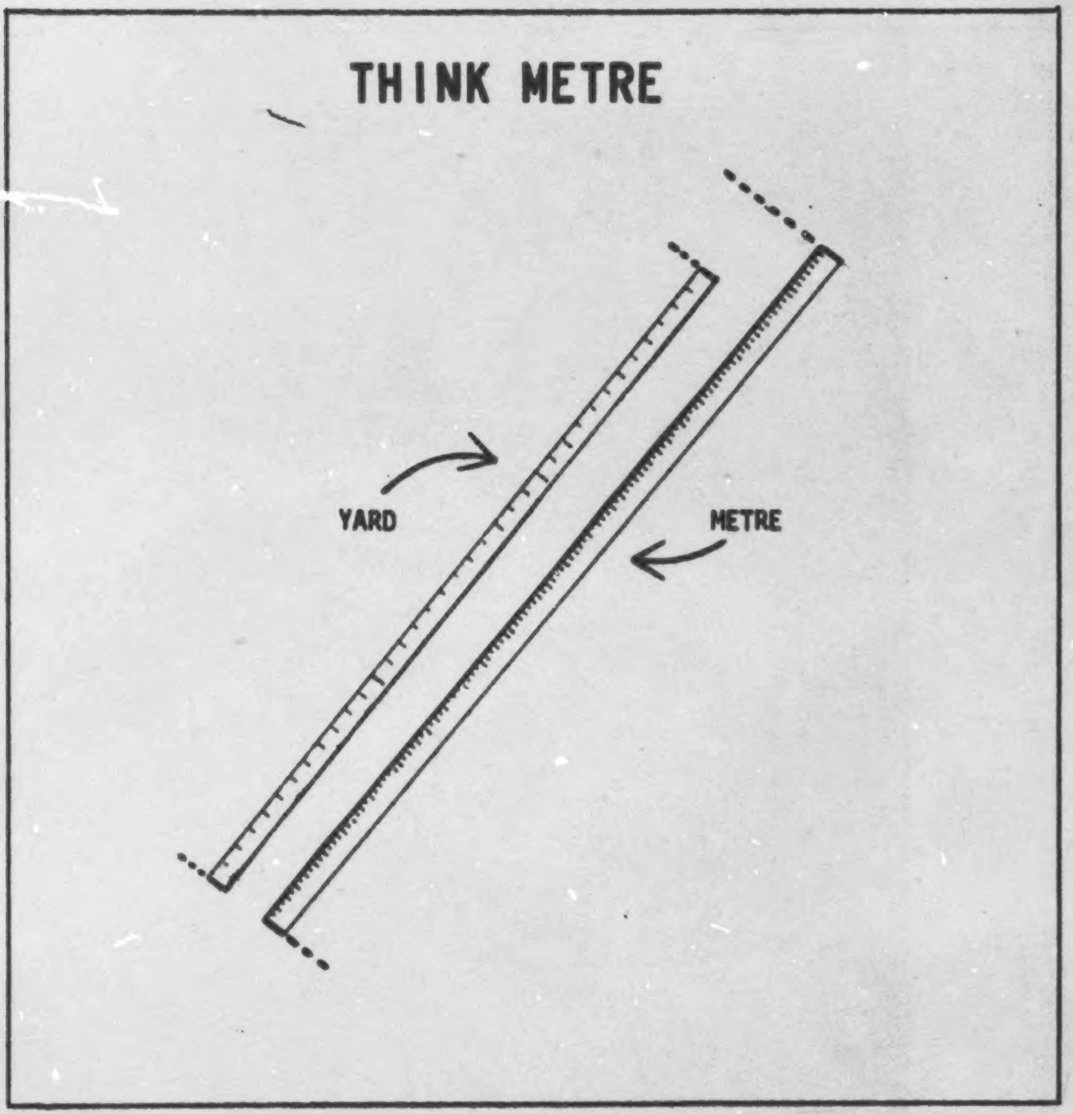
METRIC USAGE

QUANTITY	PREFIX	LENGTH	VOLUME	WEIGHT (MASS)
x 1 000	kilo-	kilometre	*	kilogram
x 100	hecto-	*	hectolitre	*
x 10	deka-	*	*	*
		METRE	LITRE	GRAM
÷ 10 (.1)	deci-	decimetre	*	*
÷ 100 (.01)	centi-	centimetre	*	*
÷ 1 000 (.001)	milli-	millimetre	millilitre	milligram

*not commonly used

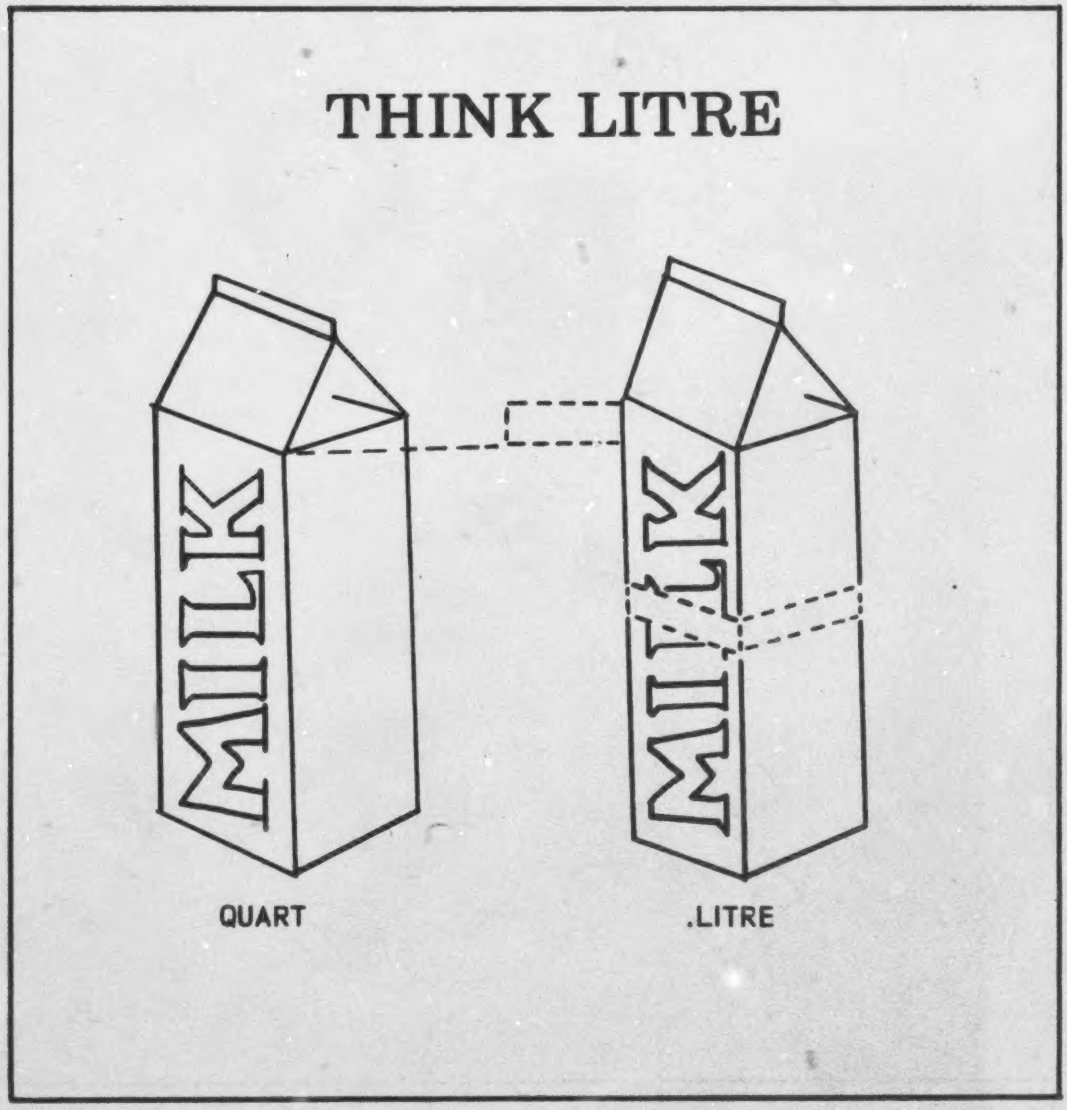
BULLETIN BOARD IDEA: "THINK METRE"

Place a metre stick next to a yard stick. Label each accordingly.


THINK METRE
YARD
METRE

BULLETIN BOARD IDEA: "THINK LITRE"

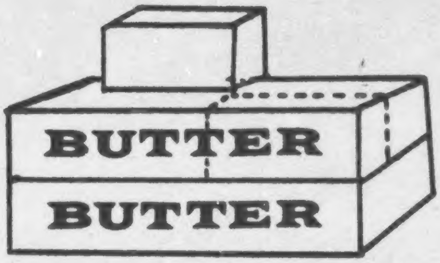
Save two quart milk cartons and rinse well. The milk carton will measure approximately 20 cm in height to the break of the cardboard. Slash the carton in the center and extend by 1 cm. Re-wrap if necessary to give the carton support. Label the unchanged carton "quart" and label the changed carton "litre." Draw a line across from the top of each to show the change more dramatically. (It actually is difficult to note the difference by vision alone.)



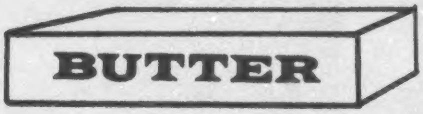
BULLETIN BOARD IDEA: "THINK KILOGRAM"

Save butter cartons. Butter is one of the few common household items that most people can visualize as to weight. Label 1 container "1 pound." Cut off 1.6 cm (5/8 in.) of 1 cube of butter and stack on top of 2 pound cartons to represent 1 kg of butter.

THINK KILOGRAM



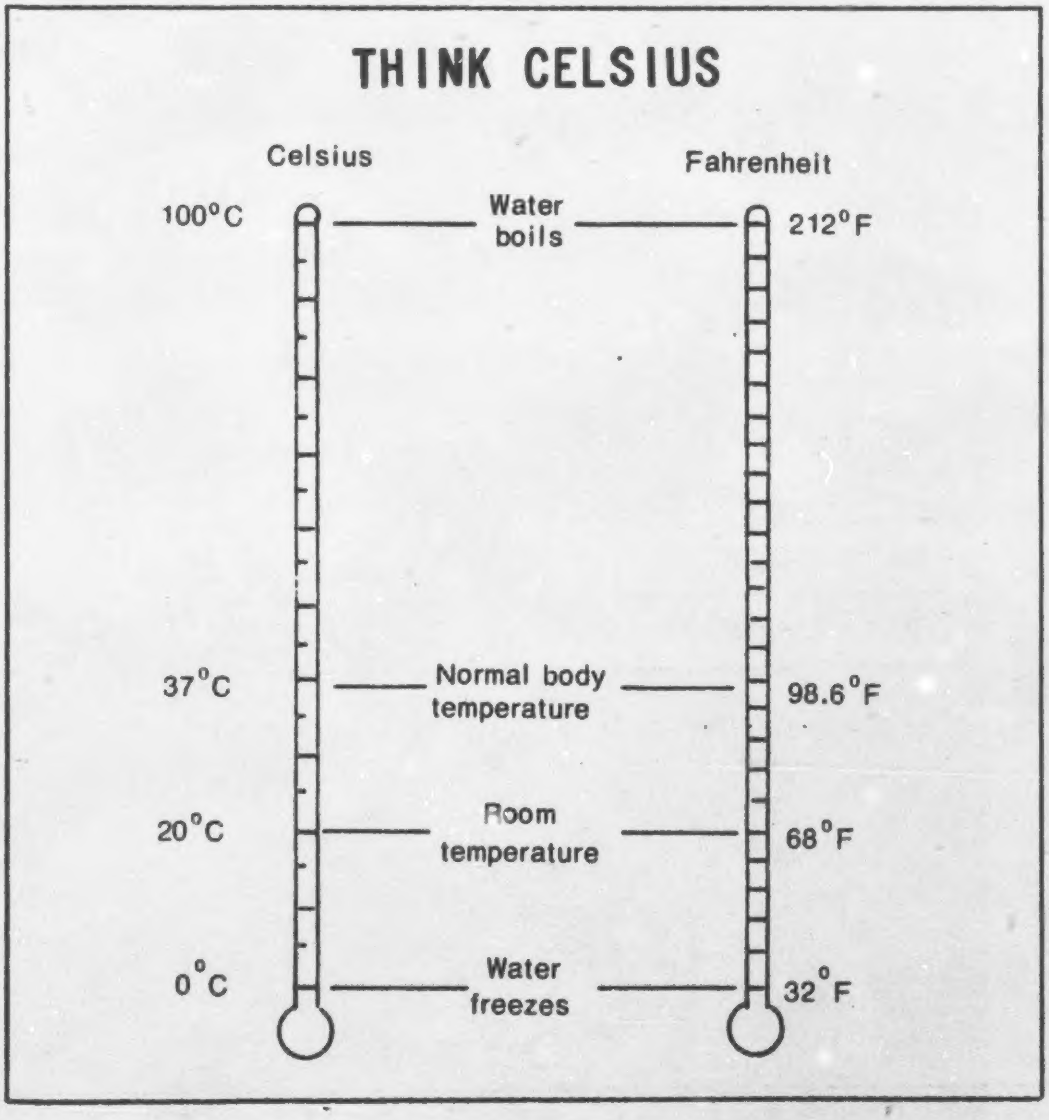
ONE KILOGRAM OF BUTTER



ONE POUND OF BUTTER

BULLETIN BOARD IDEA: "THINK CELSIUS"

Copy the following drawing by use of an opaque projector (or draw freehand). Label various temperatures accordingly.


THINK CELSIUS
Celsius
Fahrenheit
100°C
Water boils
212°F
37°C
Normal body temperature
98.6°F
20°C
Room temperature
68°F
0°C
Water freezes
32°F

TEACHING AIDS: CHALKBOARD PHRASES

While discussing the metric system, daily write a new song, phrase, or cliche on the board with metric measurements replacing the standard conventional measurements. With a conversion chart nearby, encourage the students to think of the original phrase.

"I wouldn't touch you with a 3 metre pole."

"Johnny, did you mow the back metre?"

"A miss is as good as 1.6 km"

"28.3 grams of prevention are worth 0.453 kg of cure"

"I'd walk a million kilometres for your smile."

"Give him 2.54 cm and he'll take 1 609 metres."

(song title) "155 cm, Eyes of Blue"

(birthday) "...and a pinch to grow 2.54 cm."

"More bounce to the 28.3 g"

"He wouldn't budge 2.54 cm."

"There was a crooked man and he walked a crooked .6 km."

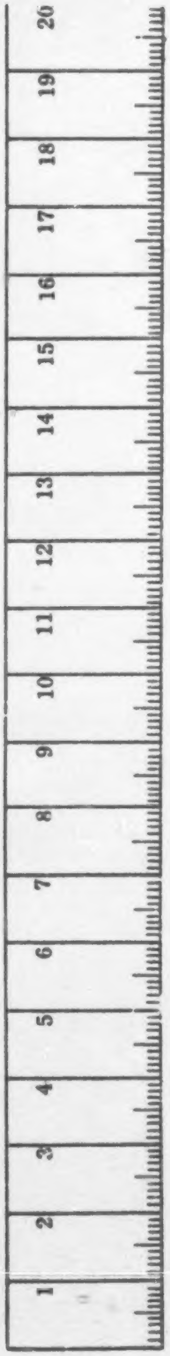
(book/movie title) "Celsius 232"

(movie title) "96 000 km Under the Sea"

(song title) "I love you 30.4 litres and 7.6 litres."

TEACHING AID: CENTIMETRE RULER

Duplicate this page. Cut out the printed 20 cm ruler. Have students glue to cardboard to use for basic measuring exercises.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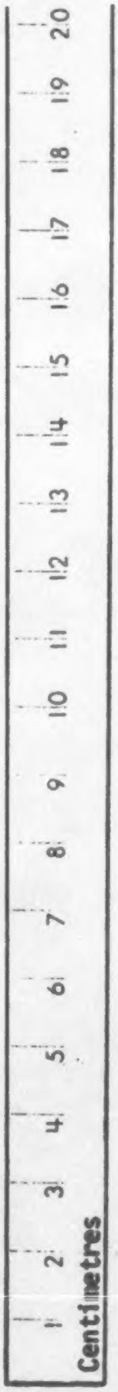
Centimetres
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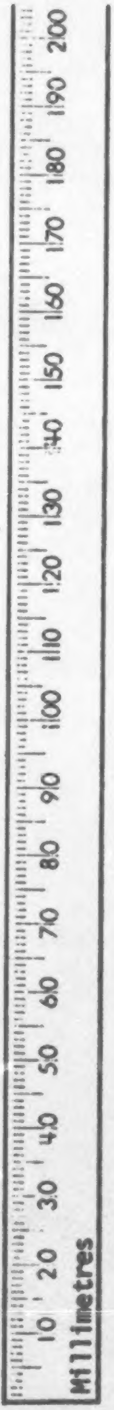
Millimetres
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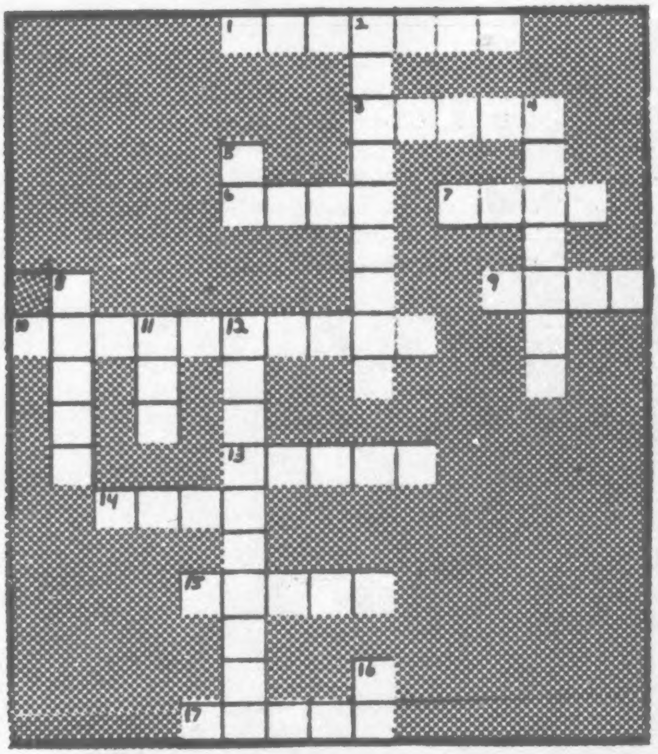
200

TEACHING AID: METRIC CROSSWORD PUZZLE



HORIZONTAL

1 The number of centimetres in a metre
3 A litre is measured as 1 000 _______ centimetres.
6 One thousand of these units is the basic metric unit for mass or weight.
7 Prefix meaning X 1 000
9 Second is a measure of _________.
10 Unit equal to 10 millimetres
13 A unit used for volume
14 The prefix for 1/10th
15 The prefix for X 100
17 The prefix for 1/100th

This crossword puzzle was adapted from one developed by the Consumer Homemaking Department at Troy High School, Fullerton Union High School District.

METRIC CROSSWORD PUZZLE - continued

VERTICAL

2 1/10th of a metre
4 The name of the metric temperature scale of 100 degrees
5 Symbol for 1 000 grams
8 The basic unit of linear measurement in the metric system
11 The entire metric system is based on multiples of ______.
12 The unit for 1/1000th of a metre
16 Abbreviation of the International System

--- KEY ---

HORIZONTAL

1	hundred
3	cubic
6	gram
7	kilo
9	time
10	centimetre
13	litre
14	deci
15	hecto
17	centi

VERTICAL

2	decimetre
4	Celsius
5	kg
8	metre
11	ten
12	millimetre
16	SI (System International)

SCHOOL ACTIVITY: INSTRUCTIONAL MINI PACKET

SUBJECT: Metrics

Developed by Christine Denzin of
California State Univ. at Long Beach
in cooperation with
Carole Bielefeld, Orange County
Department of Education, in the class
Home Economics 487 under the direction
of Kathleen Morris.
June 30, 1973.

Page 1 of 2

TITLE: Using Metric Measures in a Foods Lab Experiment

GRADE LEVEL: 9 - 12 grades

HOW TO USE:

1. The experiment should be a class exercise designed as a follow-up experience to a basic metric introduction as provided by the "SI... A Metric Workbook for Teachers of Consumer & Homemaking Education."

2. Collect, in advance, a metric kitchen scale with increments of 5 grams or less and metric measuring utensils, such as litre cups and 5, 10, and 15 millilitre spoons.

3. Demonstrate the recipe metrically so that all students are aware of the procedures. Students can hypothesize which system might be more efficient (see NOTE below).

4. Divide the students so that half will follow the recipe by measuring according to standard measures and the other half are measuring metrically.

5. Have students keep track of amount of time spent and amount of utensils used. Have students compare which method is more efficient.

NOTE: Those who weigh food ingredients with the metric system claim that recipe measurements are faster because the flour does not have to be sifted, the brown sugar does not require packing, and the air bubbles do not need to be removed from the shortening. Drawbacks to weighing, however, would be costs involved for accurate metric scales.

CHOCOLATE CHIP COOKIES

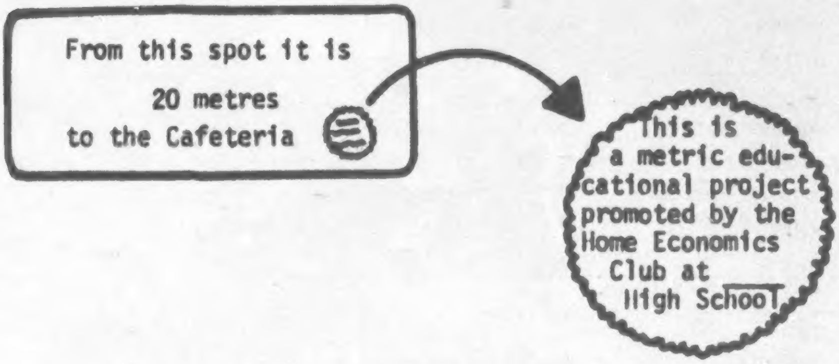
Customary Measure	Metric Measure	Directions
Oven: 350°F	Oven: 177°C	Preheat oven.
		Sift together and set aside:
1/2 C. + 1T. (sifted)	70 g	Flour
1/4 tsp.	2 g	Baking soda
1/4 tsp.	1 g	Salt
		Combine and beat together until creamy:
1/4 C.	45 g	Butter or vegetable shortening
3 T.	25 g	Granulated sugar
3 T. (packed)	40 g	Brown sugar
1/4 tsp.	2 ml	Vanilla
1/4 tsp.	2 ml	Water
		Beat in 1 egg.
		Add flour mixture; mix well.
		Stir in:
3 oz.	75 g	Chocolate chips
1/4 C.	30 g	Chopped nuts
		Drop by well-rounded "half teaspoons"
		onto ungreased cookie sheet.
		Bake 10-12 minutes or until brown.
		Makes 25.

Prepared by Orange County Department of Education for C.H.E.A. participation at Metric Workshop, U.C.L.A. Extension, September 7-8, 1973. 87340

SCHOOL ACTIVITY

The Home Economics Club or FHA on campus could initiate the following activities.

1. Measure and put up signs on campus as to the metric distance. Example:


From this spot it is
20 metres
to the Cafeteria
This is a metric educational project promoted by the Home Economics Club at ____ High School

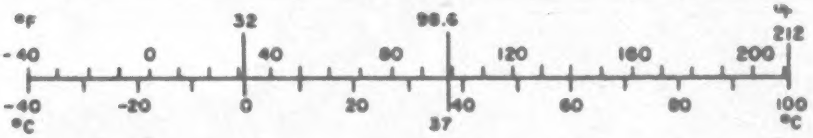
2. A metric booth could be set up on campus during lunch time for students to weigh and measure themselves. Explanatory material should also be provided. Centimetres can be marked out on a strip of butcher paper which can be taped to the wall for measuring heights. A metric bathroom scale can be purchased for this occasion.

REFERENCE: CONVERSION FACTORS

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



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*1 in = 2.54 cm (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10: 286.

REFERENCE: CONVERSION FACTORS - continued

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

This Letter Circular (LC1051) provides conversion factors for going from the more common customary units to metric units and vice versa. It may be reproduced freely. LC1051 is based on NBS Special Publication 365 (Revised Nov. 1972), "Metric Conversion Card", available by purchase as a wallet-size plasticized card from the U.S. Government Printing Office, Superintendent of Documents, Washington, D.C. 20402. Price 20 cents domestic postpaid, or 10 cents GPO Bookstore. Stock Number 0303–0168. Catalog No. C13.10: 365/2. (25 percent discount on orders of 100 or more copies).

REFERENCE: CLOTHING SIZES

There is a great deal of confusing information regarding clothing sizes and the metric system. There does not yet exist a system of "metric sizes" for women, men, or children. There has been an assumption by many Americans that the European countries use a "metric size system." Upon closer inspection, it is found that Finland, Sweden, France, Switzerland, Austria, Denmark, and the United Kingdom each have their own variation of garment sizes and identify the sizes in a differing manner. Because of this confusion, the American garment industry hesitates to change to one of the European systems . . . and understandably so!

A definite need exists to develop a coordinated effort for an international garment sizing system.

An attempt to standardize shoe sizes in South Africa resulted in development of the MONDOPOINT SYSTEM. The following quote is from "Metrication for the Family," a publication of the South African Bureau of Standards:

> In South Africa, footwear was imported from countries using four different sizing systems. To overcome so much confusion the MONDOPOINT SYSTEM was developed. The shoe size comprises two numbers, the size and the width index. The size is obtained by measuring the actual length of the foot in millimetres while the person is standing on that foot. The width index indicates the fitting. Once the Mondopoint System is in use, it will make no difference where you buy your shoes...in Johannesburg, Paris or London...the size will remain the same.

PATTERN SIZING-BODY MEASUREMENT CHART
IN ROUNDED CENTIMETRES

MISSES'

Misses' patterns are designed for a well proportioned and developed figure, about 5'5" to 5'6" without shoes.

Size	6	8	10	12	14	16	18
Bust	77	80	83	86	91	97	102
Waist	56	58	61	65	69	74	79
Hip	83	85	88	91	97	102	107
Back Waist Lg.	39	40	41	41	42	43	43

MISS PETITE

New size range designed for the shorter Miss figure, about 5'2" to 5'3".

Size	6mp	8mp	10mp	12mp	14mp	16mp
Bust	77	80	83	86	91	97
Waist	57	60	62	66	70	75
Hip	83	85	88	91	97	102
Back Waist Lg.	37	37	38	39	39	40

JUNIOR

Designed for a well proportioned, shorter waisted figure, about 5'4' to 5'5".

Size	5	7	9	11	13	15
Bust	76	79	81	85	89	94
Waist	55	57	60	62	66	71
Hip	81	84	86	90	94	99
Back Waist Lg.	38	39	39	40	41	41

WOMEN's

Designed for the larger, more fully mature figure, about 5'5" to 5'6" without shoes.

Size	38	40	42	44	46	48	50
Bust	107	112	117	122	127	132	137
Waist	86	91	97	103	109	116	122
Hip	112	117	122	127	132	137	142
Back Waist Lg.	44	44	44	45	45	46	46

HALF-SIZE

For a fully developed figure with a short backwaist length. Waist and hip are larger in proporation to bust than other figure types. About 5'2" to 5'3".

Size	10½	12½	14½	16½	18½	20½	22½	24½
Bust	84	89	94	99	104	109	114	119
Waist	66	71	76	81	86	93	99	105
Hip	89	94	99	104	109	116	122	128
Back	38	39	39	40	40	41	41	41

JUNIOR PETITE

Designed for a well proportioned petite figure, about 5' to 5'1".

Size	3jp	5jp	7jp	9jp	11jp	13jp
Bust	77	79	81	84	86	89
Waist	56	57	60	62	65	67
Hip	80	81	84	86	89	91
Back Waist Lg.	36	36	37	37	38	39

REFERENCE CHART NECESSARY FOR STATION "GREEN"

METRIC CHART
CONVERTING INCHES AND YARDS TO CENTIMETRES AND METRES

Extra fabric is needed to match plaids, stripes, one-way designs. SIMPLICITY 5574

STANDARD	Bust	83	86	92	97	102 cm
BODY	Waist	61	65	69	74	79 cm
MEASURE-	Hip-22.9 cm below waist	88	91	97	102	107 cm
MENTS	Back-neck to waist	40.5	41	42	42.5	43 cm
Fabric required	Sizes	10	12	14	16	18
Front Wrap-Top						
90 cm without nap		2.90	2.90	2.90	2.90	3.00 m
115 cm " "		2.10	2.40	2.55	2.65	2.75 m
140 cm " "		1.50	1.60	1.85	1.95	2.20 m
150 cm " "		1.40	1.50	1.60	1.75	1.85 m
Pants						
115 cm, 140 cm without nap		2.40	2.40	2.40	2.40	2.55 m
150 cm without nap		2.10	2.20	2.40	2.40	2.55 m
Elastic - 2 cm wide		0.70	0.80	0.80	0.95	0.95 m
Garment Measurements						
Finished back length of front-wrap top		57.8	58.4	59	59.7	61 cm
Finished length at side seam from waistline marking of pants		104.1	104.7	105.3	105.9	106.7cm
Bottom width of pants leg		87	89.5	92.7	95.8	99 cm

Sewing notions: Thread, seam binding or stretch lace.

REFERENCE: LENGTH OF ZIPPER -- CONVERSION CHART

Inch	Centimetre	Inch	Centimetre
4	10	20	50
6	15	22	55
8	20	24	60
10	25	26	65
12	30	28	70
14	35	30	75
16	40	32	80
18	45		

REFERENCE: FABRIC LENGTH -- CONVERSION CHART

Yard	Metre	Yard	Metre
1/8	0.10	1	0.90
1/4	0.20	2	1.80
3/8	0.30	3	2.80
1/2	0.50	4	3.70
2/3	0.60	5	4.60
3/4	0.70	6	5.50
7/8	0.80	7	6.40
		8	7.40
		9	8.30
		10	9.20

These equivalents are only approximate.
Remember: 0.10 m = 10 cm
0.20 m = 20 cm, etc.

REFERENCE: COMMON HOUSEHOLD MEASURES (CONVERSIONS)

1 teaspoon = 5 millilitres (ml)
1 tablespoon = 15 ml
1 cup = 225 ml (approx.)
1 pound of meat (plus a little more) = 1/2 kilogram (k) or 500 grams (g)
2 pounds of meat (plus a little more) = 1 kg
1 ounce = approximately 30 g
1 quart (plus a little more) = 1 litre (1)

* * *

REFERENCE: MEASURING COMMON FOOD PRODUCTS

Measure the following foods by the gram or kilogram:

Flour
Sugar
Rice
Onions
Potatoes
Apples
Margarine
Crackers
Shortening
Coffee

Measure the following foods by the litre:

Milk
Water
Oil

* * *

REFERENCE: OVEN TEMPERATURES

Suggestion: Duplicate this chart, cover with plastic, and attach to your oven or cooking area.

Oven Temperatures	°F	°C
Very slow	250 - 275	120 - 135
Slow	300 - 325	150 - 165
Moderate	350 - 375	175 - 190
Hot	400 - 425	205 - 220
Very hot	450 - 475	230 - 245

REFERENCE: BAKING UTENSILS -- STANDARD SIZES IN U.S. CUSTOMARY UNITS AND IN ROUNDED METRIC UNITS

Utensil	U.S. Customary Units	Metric Units, Rounded
Cake Pans:		
Oblong	13" x 9" x 2"	33 cm x 23 cm x 5 cm
Round	8" round 9" round 10" round	20 cm round 23 cm round 25 cm round
Square	8" square 9" square 10" square	20 cm square 23 cm square 25 cm square
Tube (Angel)	9" 10"	23 cm 25 cm
Pie Pans:	6" 8" 9" 10"	15 cm 20 cm 23 cm 25 cm
Cookie Sheet:	14" x 10"	36 cm x 25 cm
Jelly Roll Pan:	15½" x 10½" x 1"	39 cm x 25 cm x 3 cm
Loaf Pan:	9" x 5" x 3"	23 cm x 13 cm x 8 cm

SOURCE OF METRIC SUPPLIES

Dick Blick Company, P. O. Box 1267, Galesburg, Illinois 61401. Telephone: (309) 343-6181. Send for their colorful catalogue. Here are some of their items which are designed for consumer use:

100 cm coated linen tape measure (#88010)	$ 2.40/set of 10
Strong 1 kg scale divided into 10 gram increments (#88117)	$ 11.50 ea
Strong 5 kg scale divided into 20 gram increments (#88116)	$ 11.50 ea
Celsius cooking thermometer from 20° C to 260° C (#88124)	$ 11.50 ea
A clear plastic litre cube graduated in 100 ml divisions (#33134)	$ 2.50 ea
Measuring beaker set for consumer use; sizes of 2 litre, 1 litre, 500 ml, and 250 ml (#88137)	$ 6.80/set of 4

Foley plastic measuring cup marked both in litres and cups is available under $1.00 each at the Sav-On Drug Stores and other discount houses.

Kitchen measuring utensils have been found in limited quantities from various local gourmet shops, import stores, and European-geared stores such as: Karen Margreta's in Corona del Mar, Alpine Village in Torrance, Old Town in Torrance, various health food stores, and hospital suppliers.

THINK METRIC bath scales are available from Regal-Beloit Corp., Rockton Road, P.O. Box 38, South Beloit, Illinois, for $9.95.

Cal Western Supply Company, 126 East Graham Place, Burbank, CA 91502, handles metric and industrial hardware, tools and gauges. They are also a local distributor of THINK METRIC bathroom scales and metre sticks. Call (213) 849-6711 to place an order.

A bathroom scale in American pounds and metric kilograms (#MK 734, in white, black, or green) is available at $10.95 from A. Balla & Company, 3494 North Ocean Blvd., Fort Lauderdale, Florida 33308.

Handy "Cook 'N Sew English Metric Converter" is available for $2.50 from Union Carbide Corporation, Educational Aids Department, P.O. Box 363, Tuxedo, New York 10987.

SOURCE OF METRIC SUPPLIES - continued

Handy Metric Conversion Chart, 25 cents each from Bennett Books Company, 908 West Detweiller Drive, Peoria, Illinois 61614

The following list of metric training aids are available from Metric Association, Inc., Sugarloaf Star Route, Boulder, Colorado 80302.

20 cm white plastic RULER: 10 or more 10 cents each
1.5 m flexible plastic MEASURING TAPE:
5 or more 40 cents each
50 or more 30 cents each
METRIC UNITS OF MEASURE, pamphlet, 10 or more 10 cents each
METRIC HANDBOOK FOR HOSPITALS, booklet:
5 or more 40 cents each
50 or more 30 cents each
METRIC CONVERSION CARD: 10 cents each

Minimum order is $1.00. Prices include shipping.

AIDS FOR THE AGE OF METRIC

ORDER	NO.	DESCRIPTION		MASS	WEIGHT	PRICE
______	5345	4 Pc. Metric Weights (Mass Pieces): 100 g 50 g 25 g 25 g	Set	227 g	8 oz.	$ 7.00
______	5346	Single Beam Balance Scale With No. 5349 Metric Weights (Mass Pieces)	Each	1.35 kg	3 lbs.	18.50
______	5349	8 Pc. Metric Weights (Mass Pieces): 50 g 20 g 10 g 10 g 5 g 2 g 2 g 1 g	Set	113 g	4 oz.	3.00
______	5416	Celsius Laboratory Thermometer	Each	57 g	2 oz.	2.75
______	5556	Celsius Student Thermometers	Pkg. of 10	113 g	4 oz.	4.00
		Celsius Student Thermometers	Pkg. of 100	1.13 kg	2½ lbs.	35.00
______	70301	Meter Stick	Each	113 g	4 oz.	.75
______	7030	Meter Sticks	Pkg. of 10	907 g	2 lbs.	5.00
______	7031	Demonstration Meter Stick	Each	227 g	8 oz.	2.25
______	7034	20 cm Student Rulers (Plastic)	Pkg. of 10	85 g	3 oz.	2.00
		20 cm Student Rulers (Plastic)	Pkg. of 100	850 g	1 lb. 14 oz.	14.50
______	70361	1.5 m Measuring Tape	Each	28 g	1 oz.	.50
______	7036	1.5 m Measuring Tapes	Pkg. of 20	454 g	1 lb.	9.00
		1.5 m Measuring Tapes	Pkg. of 100	2.27 kg	5 lbs.	40.00
______	70391	Metric Wall Chart 106 cm x 73 cm Full Color	Each	57 g	2 oz.	2.50
______	7039	Metric Wall Chart 106 cm x 73 cm Full Color	Pkg. of 10	570 g	1¼ lbs.	20.00
______	7045	Metric Volume Set – Plastic 1 each: 1000 ml 250 ml 100 ml 50 ml 10 ml	Set	336 g	12 oz.	7.00
______	70551	*Publication – Metric Units of Measure	Each	14 g	½ oz.	.40
______	7055	Metric Units of Measure	Pkg. of 10	142 g	5 oz.	3.50
		Metric Units of Measure	Pkg. of 100	1.42 kg	3 lbs. 2 oz.	25.00
______	70561	*Publication – Metric Supplement to Science and Math	Each	85 g	3 oz.	1.25
______	7056	Metric Supplement to Science and Math	Pkg. of 10	850 g	1 lb. 14 oz.	7.50
		Metric Supplement to Science and Math	Pkg. of 100	8.5 kg	18¾ lbs.	50.00
______	70571	*Publication – Metric Handbook for Hospitals	Each	28 g	1 oz.	.50
______	7057	Metric Handbook for Hospitals	Pkg. of 10	198 g	7 oz.	4.50
		Metric Handbook for Hospitals	Pkg. of 100	1.98 kg	4 lbs. 6 oz.	30.00
______	7058	"Go Metric" Lapel Pins	Pkg. of 10	14 g	½ oz.	5.00
		"Go Metric" Lapel Pins	Pkg. of 100	142 g	5 oz.	40.00
______	7059	"Go Metric" Bumper Stickers	Pkg. of 10	57 g	2 oz.	1.50
		"Go Metric" Bumper Stickers	Pkg. of 100	570 g	1¼ lbs.	10.00
______	7566	Place Value Building Set	Set	3.4 kg	7½ lbs.	39.75
______	7777	Metric Place Value Chart	Each	567 g	1¼ lbs.	2.80
______	4810	Think Metric Sound Filmstrip (Educational Products Inc.) 2 full color filmstrips, 84 frames with accompanying cassette sound. Acceptable grade school students through adult education.	Set	454 g	1 lb.	29.00

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BIBLIOGRAPHY

Antoine, Valerie (ed.), "Los Angeles Technography," Newsletter of Los Angeles Chapter, Society for Technical Communication, Litton Data Systems Division, Vol. 14, No. 3, April-June, 1973.

------, "Thinking Metric--Metric Aid Series 1 through 4--Providing the Basics of the Metric System for Everyday Use." Available from Metric Association, 10245 Andasol Avenue, Northridge, CA 91324 $2.00.

Gilbert, Thomas F. and Marilyn B. Gilbert, Thinking Metric, John Wiley and Sons, Inc., 1973.

Helgren, Fred J., "Schools Are Going Metric," The Arithmetic Teacher, April, 1973, pp. 265-267.

Hopkins, Robert A., The International (SI) Metric System and How It Works, Polymetric Services, Inc., Reseda, CA 91335, 1973, $12.95.

Hunt, Fern E., "Food Preparation--Recipes and Their Conversion," Speech available from American Home Economics Association, 2010 Massachusetts Avenue, NW, Washington, D. C. 20036.

"Metric Units of Measure," 10th edition, Metric Association, Inc., 2004 Ash Street, Waukegan, Illinois 60085, 1972.

"Metrication for the Family," M-19, Metrication Department, South African Bureau of Standards, Pretoria, May, 1971. Available from American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

National Council of Teachers of Mathematics and American Association of School Librarians, "One To Get Ready, A Selected Bibliography on Metrication," April, 1973. Available from American Assn. of School Librarians, 50 E. Huron, Chicago, Illinois 60611. Price: 5 per $1.00.

Patterson, Joyce, "Think Metric to Meet the Challenge," Co-Ed, September, 1972.

Ryan, Mildred C., "The Metric System and the Sew-Set," Speech available from American Home Economics Association, 2010 Massachusetts Avenue, NW, Washington, D. C. 20036.

Sokol, Louis (ed.), "Metric Association Newsletters," Sugarloaf Road, Salina Star Route, Boulder, Colorado 80302.

Trueblood, Cecil R., Metric Measurement Activities and Bulletin Boards, The Instructor Publications, Inc., Dansville, New York, 1973.

BIBLIOGRAPHY - continued

U. S. Department of Commerce, National Bureau of Standards, "Report to the Congress: A Metric America, A Decision Whose Time Has Come," Publication NBS SP 345. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 Price: $2.25.

------, "Toward a Metric America, NBS List of Publications 67, A Brief Bibliography and Other References," November, 1973. Available from Metric Information Office, National Bureau of Standards, Washington, D. C. 20234

------, "U. S. Metric Study Interim Report: Education," Publication NBS SP 345-6. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price: $1.75.

------, "U. S. Metric Study Interim Report: The Consumer," Publication NBS SP 345-7. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price: $1.25.

Westbrook, Wilmer, "The Metric System," Modern Textiles, August, 1970, pp. 18-20.